BIOMARKER MANUAL:

DEMOGRAPHIC AND HEALTH

Training Program for Measuring and Testing for Biomarkers

[DOCUMENT SUBTITLE]

The DHS Program is a five-year project to assist institutions in collecting and analyzing necessary data to plan, monitor, and evaluate population, health, and nutrition programs. The DHS Program is funded by the U.S. Agency for International Development (USAID). The project is implemented by ICF in Rockville, Maryland USA, in partnership with the Johns Hopkins Bloomberg School of Public Health/Center for Communication Programs, PATH (formerly, the Program for Appropriate Technology in Health), Avenir Health, Vysnova Partners, Blue Raster, and EnCompass.

The main objectives of The DHS Program are to: 1) provide improved information through appropriate data collection, analysis, and evaluation; 2) improve coordination and partnerships in data collection at the international and country levels; 3) increase host-country institutionalization of data collection capacity; 4) improve data collection and analysis tools and methodologies; and 5) improve the dissemination and utilization of data.

Information about The DHS Program may be obtained from ICF, 530 Gaither Road, Suite 500, Rockville, MD 20850, USA; Telephone: +1-301-407-6500; Fax: +1-301-407-6501; E-mail: info@dhsprogram.com; Internet: http://www.dhsprogram.com.

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Chapter 1. INTRODUCTION AND OVERVIEW

1.A. About this manual

This manual is used as part of the Training Program for Measuring and Testing for Biomarkers, and provides the core content needed to acquire the following skills during the training:

- How to identify eligible respondents in households for biomarker measurement
- How to obtain informed consent from adults, minors and parents/responsible adults for children
- How to complete the Biomarker Questionnaire
- How to perform capillary blood collection on adults and children
- How to select the appropriate equipment; collect samples; conduct tests and record, report, and document results for the following, as needed:
  - Hemoglobin testing for anemia
  - Height and weight measurements for anthropometry
  - Demonstrate appropriate universal safety precautions
  - Demonstrate appropriate disposal of biohazardous waste

1.B. About this training program

Biomarker measurements can serve as diagnostic tools to identify diseases or conditions in their early stages and can be used as surveillance tools to track changes in disease patterns or to evaluate intervention programs. In population-based surveys, biomarkers help assess the prevalence or occurrence of diseases or conditions in a population; they can also be used at a macro level to measure the long-term effect of policies and programs. In The Demographic and Health Surveys (DHS) Program, biomarkers are measured to estimate the prevalence of specific diseases and health conditions at the population level.

This training program is designed to equip biomarker technicians with skills and techniques to efficiently and effectively measure and test biomarkers in field conditions, and accurately record and report the results as part of the survey process. In addition, this training program will equip biomarker technicians to collect, process, and package biological specimens for transport to a laboratory for testing.

1.C. Training program structure

In combination with classroom instruction and practical experience, this manual will be used to teach you how to collect blood samples and conduct basic tests to

measure biomarkers for the [YEAR] [COUNTRY] Demographic and Health Survey (DHS). Before each training session, you should study this manual and the Biomarker Questionnaire carefully. You are encouraged to ask questions during training and to discuss problems encountered to avoid making mistakes during fieldwork. Training consists of the following phases:

- Phase I. The chapters of this manual are reviewed in a classroom setting where you learn how to identify eligible respondents; record biomarker measurements or test results in the Biomarker Questionnaire or on appropriate field forms; and handle technical procedures involved in blood collection, testing, and other related instructions. You will observe the trainers demonstrating the skills. Then, you will have the opportunity to practice the procedures, with other trainees, which will include finger pricks for blood collection.
- Phase II. You will either 1) visit a health facility and practice measuring biomarkers from respondents after consent was granted or 2) practice the blood collection procedures on participants (i.e., mother-child pairs) at the training venue.
- Phase III. You will be assigned to a survey trainee team in the field where you will measure biomarkers from eligible respondents exactly as you would during the survey. Households that are visited will be in clusters that are not part of the survey sample.

At the end of the training, your overall performance will be assessed, and the top performers will be selected to work in the survey.

Your training does not end at the start of fieldwork. Rather, it is a continuous process. Your team supervisor and the [COUNTRY] DHS coordinators will play important roles in continuing your training and in ensuring the quality of data you collect throughout the survey. They will:

- Observe your fieldwork activities periodically to ensure that you are conducting yourself professionally, obtaining informed consent from respondents, and following the sample collection and biomarker measurement protocol correctly
- Spot check that you visited the correct households and collected blood samples and measured biomarkers only from eligible respondents; and
- Meet with you regularly to discuss your performance and assign future work assignments

Note: A biomarker technician who is not performing at the level necessary to produce the high-quality data required for a successful [COUNTRY] DHS may be released from service.

1.D. Overview of biomarker measurement

A biomarker may be thought of as a characteristic that can be independently measured and evaluated as an indicator of normal biologic processes, pathogenic processes, or pharmacologic response to a therapeutic intervention[1]. Biomarker measurements can serve as diagnostic tools to identify diseases in their early stages and can be used as surveillance tools to track changes in disease patterns or to evaluate intervention programs. In population-based surveys, biomarkers help assess the prevalence or occurrence of diseases or conditions and can also be used at a macro level to measure the long-term effect of policies and programs.

Biomarker measurements can serve to:

- Assess the prevalence of a health condition among adults and children at the population level
- Develop and evaluate health-intervention programs to prevent or reduce a health condition/disease (e.g., iron-deficiency anemia) among adults and children
- Develop diagnostic tools to identify diseases in their early stages
- Track changes in disease patterns within the population

Purpose of each biomarker measured in the DHS

Biomarker	Purpose
Height and weight	Monitor growth in women and children; calculate the body mass index (BMI) of adults and BMI-for-age of adolescents
Hemoglobin (anemia)	Measure iron status (Acts as a crude marker)

The [YEAR] XDHS is the [NUMBER] DHS survey conducted in [COUNTRY] following [INSERT PREVIOUS DEMOGRAPHIC AND HEALTH SURVEYS AND YEAR]. The [YEAR] XDHS will include anemia and anthropometry. Results from this survey will produce country specific nutritional indicators, and population-based estimates of anemia in women age 15-49, men age 15-[59], and children age 6-59 months.

1.E. Overview of the biomarkers in the DHS & the biomarker technician's role

Anthropometry measurements

In XDHS, the biomarker technician will measure the height and weight of eligible women, men, and children. The biomarker technician will measure women age 15-

[1] Biomarker Definitions Working Group, National Institutes of Health, 2001

49 and men age 15-[59]. The biomarker technician will measure children 0 – 59 months. Children younger than 24 months will be measured lying down on the measuring board, while biomarker technicians will measure standing height for older children. They will obtain weight measurements using lightweight, digital scales.

For children, data are used to calculate three indices that reflect nutritional status: height-for-age, weight-for-height, and weight-for-age. In presenting the anthropometric results, the height and weight of children in the survey population are compared with the 2006 WHO Child Growth Standards that are based on an international sample of ethnically, culturally, and genetically diverse, healthy children living under optimum conditions conducive to achieving a child's full genetic growth potential.

Children who are severely malnourished will be referred to a local health facility for assessment and treatment. The biomarker technician will provide all households an informational pamphlet containing the height and weight of all eligible children and adults.

Hemoglobin (anemia)

In the XDHS, the biomarker technician will measure hemoglobin (anemia screening) in eligible women (age 15-49 years), [men (age 15-[59] years] and children (age 6-59 months). Anemia is a reduction in the normal number of red blood cells or a decrease in the concentration of hemoglobin (Hb) in the blood, which results in a decrease in oxygen reaching organs and tissues. Symptoms of anemia include pallor, fatigue and weakness, shortness of breath, and heart problems.

The biomarker technician will use the HemoCue® 201+ photometer to measure the Hb concentration from a drop of blood obtained from a finger or heel prick. The measurement is rapid, allowing results to be reported to the respondent immediately following the testing procedure.

Individuals who have an Hb level below a defined cut-off will be classified as anemic and, in cases of severe anemia, referred to a local health facility for assessment and treatment. The biomarker technician will provide all households an informational pamphlet containing the Hb measurements of all eligible children and adults.

1.F. Social media policy

The use of social media and other digital media is now common and continues to grow in popularity. Platforms and applications including blogs, social networking sites (such as Twitter or Facebook), video streaming sites (such as YouTube), and digital messaging applications (WhatsApp), have made it easy for anyone to reach a wide audience very quickly. Public and private companies and their staff also use these platforms and sites to share work experiences, images, or videos taken in the

workplace, or to seek professional advice from colleagues or friends. However, in the XDHS, the use of social media may break the promise we make to our respondents to maintain their privacy and keep all information confidential. The XDHS has also made a promise to the ICF Institutional Review Board and the [COUNTRY] Institutional Review Board to maintain anonymity of all survey respondents.

To fulfil our promise to all survey respondents to maintain strict confidentiality, all fieldworkers are obligated to follow these rules:

Social media rules for maintaining confidentiality of survey respondents	
1.	Survey staff have an ethical obligation to always maintain respondent privacy and confidentiality.
2.	Limiting access to social media postings by using privacy settings is not enough to ensure privacy or maintain the confidentiality of respondents.
3.	Do not transmit any respondent-related image or video that includes the respondent, respondent household members, or their homes, through any social media platform.
4.	Do not identify respondents, enumeration areas, or clusters by name through any social media platform. Do not post any information that may lead to the identification of a respondent or an enumeration area.
5.	Do not take any photos or videos of respondents or their homes – not even if the respondent gives permission – on personal mobile devices - including mobile phones, tablets, and cameras.
6.	Turn off or disable geolocation or geotagging permissions in social media applications on personal mobile devices while conducting fieldwork.
7.	Consult with a supervisor before making any work-related postings.
8.	Promptly report any violations of privacy or confidentiality.

What is geolocation and geotagging?

Geolocation or geotagging refers to identifying an object (for example a photo) by its location. Many social media platforms, including Twitter and Facebook, now include geolocation or geotagging, so users can add location information to their messages. The location information can be a broad location such as a city or village, or a precise location with the exact latitude and longitude of the location from which

a message was sent. A fieldworker who posts a geolocated or geotagged social media message from the field violates confidentiality by disclosing the location of the cluster.

Geolocation or geotagging in social media applications may also have security implications. In security-risk countries, where fieldwork must undergo stringent protocols to protect field teams, it is imperative that survey-related staff disable geolocation from their personal devices to not give away secure locations.

Common Misunderstandings of Social Media

Misuse of social media is often unintentional and the result of misunderstandings of how social media platforms function. Many factors may contribute to survey-related staff inadvertently violating survey respondent privacy and confidentiality while using social media.

Test your knowledge:

TRUE or FALSE?

Q 1. A communication or post is private and can only be seen by the intended recipient. True or False?

FALSE. Why? Once you send or post something, it can be sent by someone else to others, without you knowing.

Q 2. You can always delete posted content and make it “go away”. True or False?

FALSE. Why? What happens on the Internet, stays on the Internet.

Chapter 2. GENERAL PROCEDURES FOR COMPLETING THE PAPER BIOMARKER QUESTIONNAIRE

Learning objective

- Confirm the eligibility of respondents for biomarker collection
- Understand the elements of informed consent
- Know the structure and content of the Biomarker Questionnaire
- This part of the training manual is designed to familiarize you with the [COUNTRY] DHS paper questionnaire that you will use for field data collection

2.A. Introduction

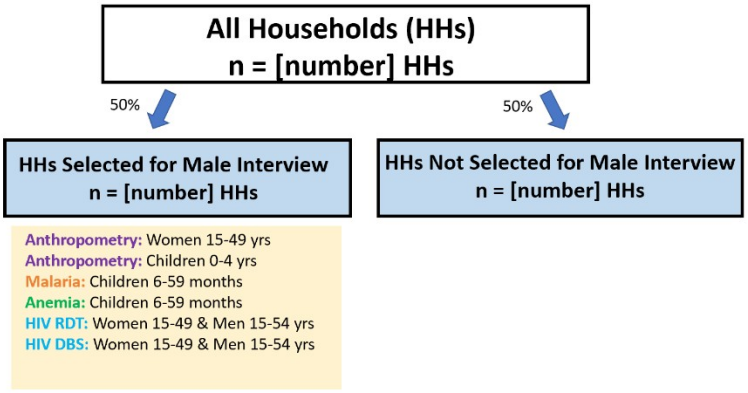
This chapter describes the [subsample of households selected for biomarker collection,] requirements for eligibility and informed consent. To collect the information needed by the [COUNTRY] DHS, you must understand how to ask each question, what information the question is attempting to collect, and how to handle problems that might arise during the interview. You must also know how to correctly record the answers the respondent gives and how to follow special instructions in the questionnaire.

2.B. Identifying respondents eligible for Biomarker Questionnaire

Eligible respondents

[Not all households are eligible for biomarker measurement and testing.] There are [NUMBER] households per cluster, [half of which were selected for biomarker collection.] This means you as a biomarker technician will visit [NUMBER] households per cluster for biomarker collection.]

The hierarchy below summarizes which households are eligible for biomarker collection.


All Households (HHs)
n = [number] HHs
50%
50%
HHs Selected for Male Interview
n = [number] HHs
HHs Not Selected for Male Interview
n = [number] HHs
Anthropometry: Women 15-49 yrs
Anthropometry: Children 0-4 yrs
Malaria: Children 6-59 months
Anemia: Children 6-59 months
HIV RDT: Women 15-49 & Men 15-54 yrs
HIV DBS: Women 15-49 & Men 15-54 yrs

Adjust the image and all related content to reflect the survey. Once completed, copy and past into the Introduction and Overview Chapter.

Not everyone in a household is eligible for biomarker measurement. Within selected households, those eligible for biomarker measurement and testing are: women age 15-49 years, men age 15-[59] years and children 0 – 59 months who are usual household residents or visitors who have stayed in the house the night before the household interview took place.

ible for biomarker measurement	Weight	Height/ length	Hb measurement (anemia testing)
Children age 0–5 months	X	X	
Children age 6–59 months	X	X	X
15–49 years	X	X	X
Men age 15–[59] years	X	X	X

Obtaining Eligibility from Computer Assisted Personal Interviewing (CAPI)

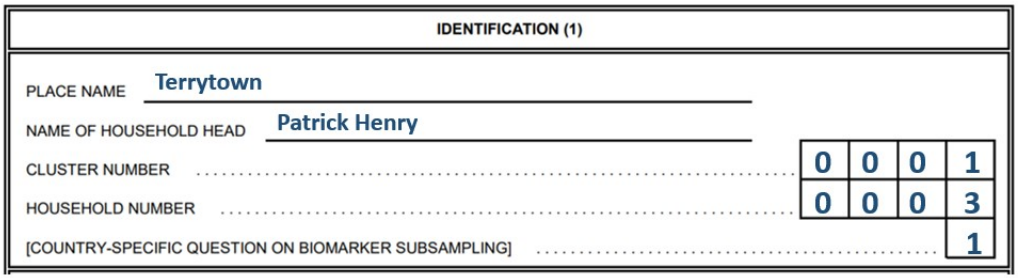
The Household Questionnaire, Woman's Questionnaire, and Man's Questionnaire use computer assisted personal interviewing (CAPI) for face-to-face interviews. However, the Biomarker Questionnaire is still completed on paper. This means that the interviewer will need to transfer the list of eligible children and adults from the report generated by the CAPI system using information collected in the Household Questionnaire to the Biomarker Questionnaire. Only then will the biomarker technician be able to start the process of identifying eligible respondents, obtaining informed consent, collecting a blood sample and testing for biomarkers.

On the cover page of the Biomarker Questionnaire, the interviewer will record all the information required to identify the household. When you receive a Biomarker Questionnaire, the interviewer should have already recorded the following into the

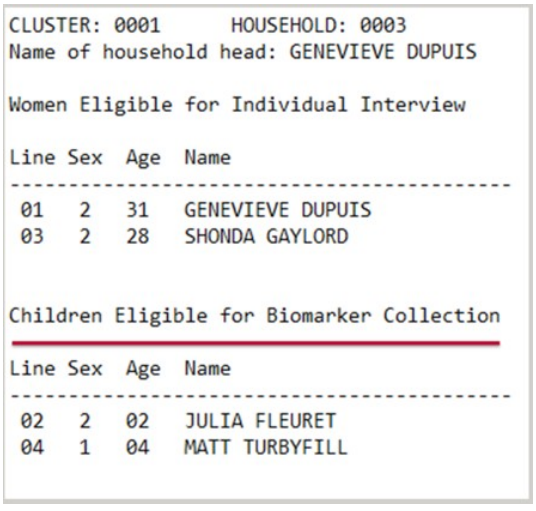
identification box:

- Place Name
- Name of Household Head
- Cluster Number
- Household Number
- [COUNTRY-SPECIFIC QUESTION ON BIOMARKER SUBSAMPLING]

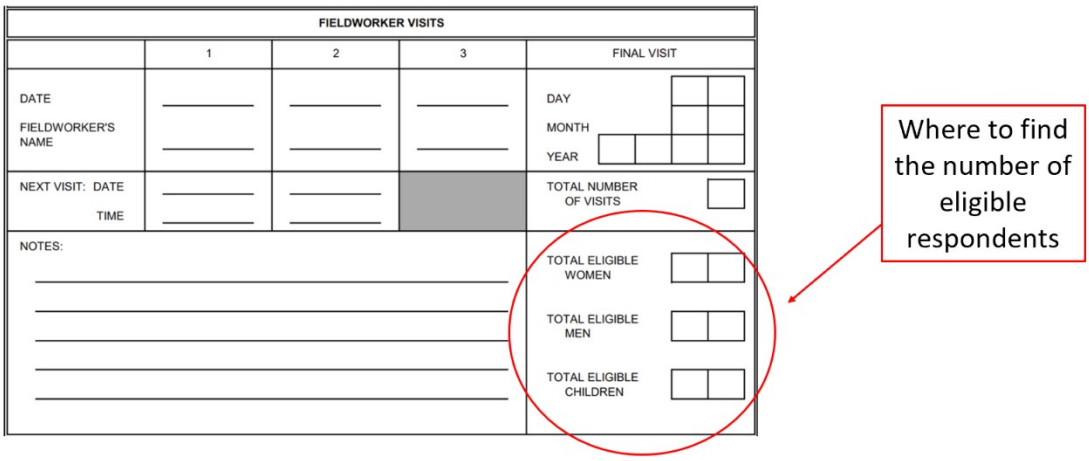
You will notice that for both the Cluster Number and Household Number four boxes are provided. When a number has fewer digits than the number of boxes provided, the leading zeros should be filled in. For example, if the cluster number is 1 and household number 3, this information should be recorded on the cover page (by the interviewer) as cluster number 0001 and household number 0003. The interviewer will indicate if the household is selected for [country-specific questions on biomarker subsampling] by writing '1' in the box provided.


IDENTIFICATION (1)
PLACE NAME Terrytown
NAME OF HOUSEHOLD HEAD Patrick Henry
CLUSTER NUMBER 0 0 0 1
HOUSEHOLD NUMBER 0 0 0 3
[COUNTRY-SPECIFIC QUESTION ON BIOMARKER SUBSAMPLING] 1

Using the CAPI function to list those eligible for individual interviews and biomarkers, the interviewer will record the number of respondents in the household potentially eligible for biomarker collection. An example of a list is shown below:


CLUSTER: 0001 HOUSEHOLD: 0003
Name of household head: GENEVIEVE DUPUIS
Women Eligible for Individual Interview
Line Sex Age Name
01 2 31 GENEVIEVE DUPUIS
03 2 28 SHONDA GAYLORD
Children Eligible for Biomarker Collection
Line Sex Age Name
02 2 02 JULIA FLEURET
04 1 04 MATT TURBYFILL

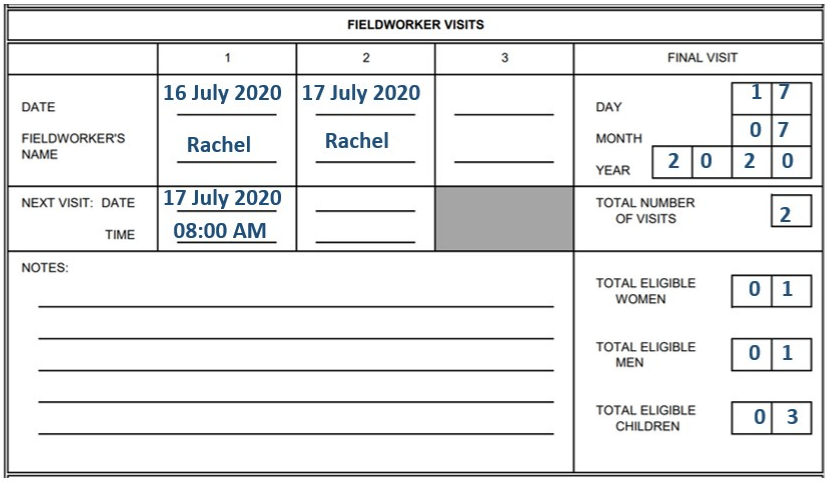
Check the cover page of the Biomarker Questionnaire to identify the number of women, men and children who are potentially eligible for biomarker collection. This information can be found under "Fieldworkers Visit."



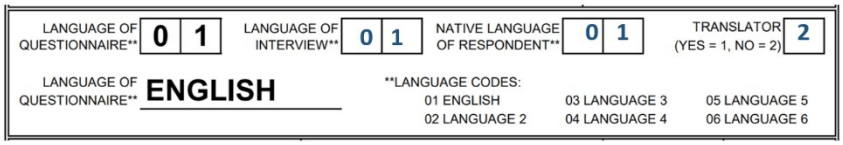
2.C. Documenting [fieldworker] visits on the cover page

As described above, the interviewer will provide the information on the cover page to identify the household and the total number of eligible children and adults. It is the responsibility of the biomarker technician to document when he/she visited the household to collect biomarkers under the section labeled, [FIELDWORKER] VISIT. You have at least three opportunities to visit the household to complete the biomarker collection. On your first visit to the household, you will record the date and write your name. If you do not complete biomarker collection for all the eligible respondents in your first visit, it will be necessary to make a second visit. You must arrange this second visit with the respondents or parent/responsible adult and ask when is the best day and time for you to return. You must record this date and time on the cover page of the biomarker questionnaire at NEXT VISIT. When you return a second time, you must document again the date of your second visit and write your name. When you have finished a household, on your last visit, you must enter the date under FINAL VISIT as DAY-MONTH-YEAR and record your TOTAL NUMBER OF VISITS. It is also acceptable for the first and second visit to occur on the same day if the respondent or the parent/responsible adult requests it. However, if you return to that household on the same day and the child still is not present, you are required to make two additional visits to that household.

Example: In a household there is 1 woman, 1 man and 3 eligible children. You arrive to the house for your first visit on 16 July 2020 and complete biomarker testing for the woman and all 3 children. You are told by the woman to return on 17 July at 8:00 AM to speak with the male respondent. You make a second visit to the household on 17 July at 8:00 AM and complete the biomarker testing for the male respondent. You finished testing the man on 17 July and made 2 visits to the household. It is important to complete the FIELDWORKER VISITS section daily. Do not wait until you finish a household to complete this section. You will enter your final visit only once you have completed the household. You or the interviewer can record notes in the NOTES section that pertain to the household or respondents.



The language of the questionnaire is prepopulated. You are responsible for recording the language of the interview and native language of the respondent using the LANGUAGE CODES on the cover page. You also must indicate if 'YES' a translator was used by entering 1, or 'NO' a translator was not used by entering '2' in the space provided.



2.D. Asking Questions and Reading Informed Consent Statements

It is very important that you ask each question and read consent statement exactly as it is written in the questionnaire. Always speak slowly and clearly so that the respondent will have no difficulty hearing or understanding the question or consent statement. At times you may need to repeat the question or consent statement to be sure the respondent understands it. In those cases, do not change the wording, but repeat it exactly as it is written.

If, after you have repeated a question or consent statement, the respondent still does not understand it, you may have to restate it. Be very careful when you change the wording, however, that you do not alter the meaning of the original question or consent statement.

Prior to biomarker measurement, one of the primary tasks is to explain the purpose of the measurement or test to eligible respondents or, in the case of children, to the parent or responsible adult, and to obtain their consent before collecting blood samples or conducting biomarker measurements. In the absence of a parent, the consent of a responsible adult who is at least 18 years of age is required. If the parent or responsible adult does not consent to the test, the test must not be

performed.

Process of obtaining informed consent for children:

Group	Process
Children (age 6-59 months)	Obtain the consent of one of the child's parents, or, in the absence of a parent, the consent of a responsible adult who is at least 18 years of age. If the parent or responsible adult does not consent to the test, do not perform the test.

To ensure that these individuals can make an "informed" decision about whether to have their children tested, the Biomarker Questionnaire includes a consent statement which you must read to the parent/responsible adult. These consent statements include the following basic elements:

- A description of the objectives of the test
- Basic information on how the test will be conducted
- Assurances about the confidentiality of the results
- A specific request for permission to collect the sample and do the testing

If you have to reword the consent statement so that the respondent may understands it, you must still include these four elements of informed consent listed above.

You will notice that some questions contain one or more words in parentheses. As shown below, the presence of parentheses indicates that a sentence needs to be adapted to fit the respondent's specific situation.

Parentheses that indicate a substitution must be made:

Example:

ASK CONSENT FOR ANEMIA TEST FROM PARENT/RESPONSIBLE ADULT:

As part of this survey, we are asking people all over the country to take an anemia test. Anemia is a serious health problem that usually results from poor nutrition, infection, or chronic disease. This survey will assist the government to develop programs to prevent and treat anemia. We ask that all children under age 5 take part in anemia testing. The anemia test requires a few drops of blood from a finger or heel. The equipment used to take the blood is clean and completely safe. It has never been used before and will be thrown away after each test.

The blood will be tested for anemia immediately, and the result will be told to you right away. The result will be kept strictly confidential and will not be shared with anyone other than members of our survey team.

Do you have any questions?
You can say yes or no. It is up to you to decide.
Will you allow (NAME OF CHILD) to participate in the anemia test?

Notice that the word in parentheses is in all capital letters. **Words in all caps are instructions to biomarker technicians that are not meant to be read out loud**. Instead, in this example, you should substitute in the <u>name of child</u> for which

you are seeking informed consent for testing. For instance, if you are seeking informed consent for anemia testing from a woman who has a son named Barack, ask “Will you allow Barack to participate in the anemia test?”

2.E. Recording Responses

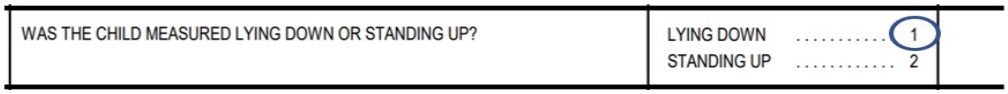
All biomarker technicians should use pens with blue ink to complete all paper questionnaires. Never use a pencil to complete the survey questionnaire.

There are generally three types of questions in the [COUNTRY] DHS biomarker questionnaire: 1) questions that have precoded responses; 2) questions that do not have precoded responses, i.e., those that are “open-ended;” and 3) filters.

Questions with precoded responses

For some questions, we can predict the types of answers a respondent will give or you know how the procedure in question was performed. The responses to these questions are listed in the questionnaire. To record a respondent’s answer, you merely circle the number (code) that corresponds to the reply. Make sure that each circle surrounds only a single number.

Example:



In some cases, precoded responses will include ‘OTHER.’ The OTHER code should be selected only when the respondent’s answer is different from any of the precoded responses listed for the question or when you have encountered an issue in the field that does not permit you to proceed with the biomarker collection. Before using the OTHER code, you should make sure the answer does not fit in any of the specified categories.

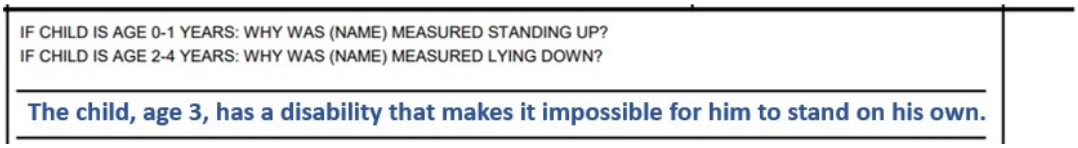
Example:

In this case, an acceptable use of ‘OTHER’ would be receiving permission from the parent/responsible adult to take the weight of the child, but you faced a mechanical issue with the scale that would not allow you to take the weight, i.e., no batteries or dead batteries.

Recording responses that are not precoded

The answers to some questions are not precoded but require that you write the appropriate response in the space provided or the respondent's results.

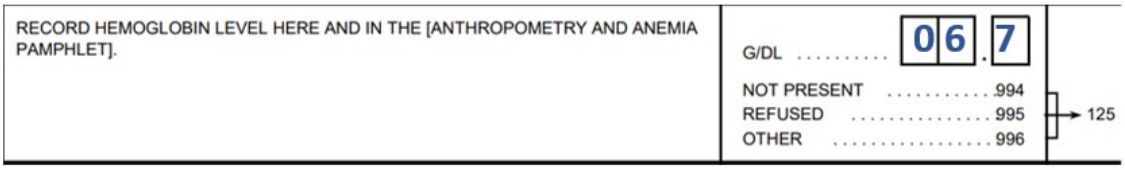
Example


IF CHILD IS AGE 0-1 YEARS: WHY WAS (NAME) MEASURED STANDING UP?
IF CHILD IS AGE 2-4 YEARS: WHY WAS (NAME) MEASURED LYING DOWN?
The child, age 3, has a disability that makes it impossible for him to stand on his own.

Recording numbers or dates in boxes

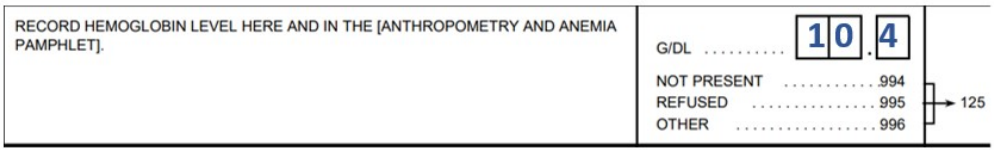
In some questions, you will record a number (i.e., result) or date in the boxes provided. In such cases, you must enter information in all the boxes.

Example: For a child with an anemia result of 6.7 g/dL.


RECORD HEMOGLOBIN LEVEL HERE AND IN THE [ANTHROPOMETRY AND ANEMIA PAMPHLET].
G/DL . . . . . 0 6 . 7
NOT PRESENT 994
REFUSED 995
OTHER 996
125

When a response has fewer digits than the number of boxes provided, you should fill in leading zeroes as shown above. An anemia result of 6.7 g/dL needs to be recorded as 06.7g/dL.

Example: For a child with an anemia result of 10.4 g/dL.


RECORD HEMOGLOBIN LEVEL HERE AND IN THE [ANTHROPOMETRY AND ANEMIA PAMPHLET].
G/DL . . . . . 1 0 . 4
NOT PRESENT 994
REFUSED 995
OTHER 996
125

Always record the result exactly as given.

2.F. Marking Filters and Following Skip Patterns

Marking Filters

Filters require you to look back to the answer to a previous question and then mark an 'X' in the appropriate box.

Example:

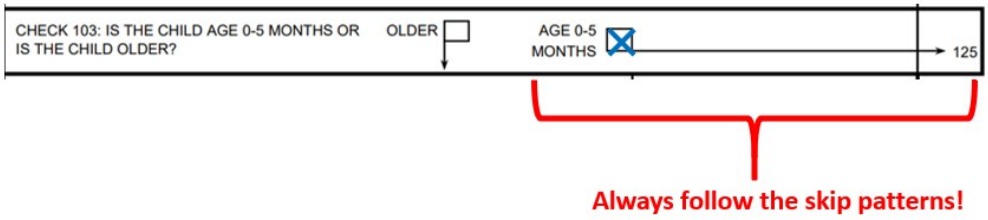
To ensure the proper flow of a paper questionnaire, you will sometimes be directed to check a respondent's answer to an earlier question, indicate what the response

was by marking a box with an 'X', and then follow the relevant skip instruction. Questions of this type are called "filters"; they are used to prevent a respondent from being asked the same question multiple times. Use caution when answering filters. Filters involve skip patterns so ensure you are following them correctly.

Following Skip Patters

It is very important not to ask a respondent any questions that are not relevant to his or her situation. For example, you should not read an anemia consent statement to a parent/responsible adult of a child age 0-5 months. In cases where a particular response makes subsequent questions irrelevant, an instruction is written in the questionnaire directing you to skip to the next appropriate question.

Example:



Unless a skip pattern is present, always move directly to the next question.

2.G. Correcting Mistakes

When working with a paper questionnaire, it is very important that you record all answers neatly. For precoded responses, be sure that you circle the code for the correct response carefully. When recording responses that are not precoded, the reply should be written legibly so that it can be easily read. If you made a mistake in entering a respondent's result, the respondent wishes to change his/her reply, or you have made a mistake, be sure that you cross out the incorrect response and enter the right answer. Just put two diagonal lines through the incorrect response.

Here is how to correct a mistake:

Example:

RECORD HEMOGLOBIN LEVEL HERE AND IN THE [ANTHROPOMETRY AND ANEMIA PAMPHLET].	G/DL . . . . . 10.4 NOT PRESENT . . . . . 994 REFUSED . . . . . 995 OTHER 996	→ 125
CHECK 122: HEMOGLOBIN RESULT	BELOW [8.0 G/DL], SEVERE ANEMIA . . . . . 1 [8.0 G/DL] OR ABOVE 2	→ 125

Remember that if you are not careful to cross out mistakes neatly, it may not be

possible to determine the correct answer when the data are entered later into the computer.

2.H. Key points to remember

The following steps are important to remember when completing the Biomarker Questionnaire:

- **Children should be measured after the mother is interviewed**. If the mother is not present in the household, children should be measured after the responsible adult has given consent for biomarker collection.
- **Measure and/or test for biomarkers one respondent at a time**. All the biomarker measurements for the [COUNTRY] DHS should be performed on one respondent before moving on to the next eligible respondent. Complete the measurement of all biomarkers from one respondent before proceeding to the next. Failure to do so may lead to the results of one respondent being recorded for another respondent.
- **Never alter any responses or information transferred by the interviewer from the CAPI list of individuals eligible for the Biomarker Questionnaire** without consulting the interviewer who completed the Household Questionnaire. Even in cases where there are concerns about a respondent's eligibility for testing, proceed with the biomarker collection. Record in the notes section of the Biomarker Questionnaire a description of the problem. Provide as many details as possible. The field organization/central office will decide later what will be done about the test results for the respondent in question.
- **Read the applicable consent statements to each adult, minor and parent/responsible adult exactly as they appear in the Biomarker Questionnaire**. When you arrive at the household and begin talking about the blood tests with the respondent, you may informally discuss items included in the informed consent statement. However, before beginning the testing procedures, you must still read the informed consent statements exactly as they appear in the Biomarker Questionnaire. If the respondent finds the statements repetitive, tell him or her that you are required to read the statements to ensure that they are given all the appropriate information.
- **Read the informed consent statements clearly.** Practice reading the consent statements out loud so that you become comfortable delivering them in a clear, natural voice and manner. Avoid speaking rapidly or in a monotone.
- **Never attempt to force or coerce consent**. Some respondents may be suspicious or fearful of having their blood collected for biomarker testing. Others may have questions or want to discuss the procedures before giving consent. Take time to patiently respond to all questions.
- Some parents/responsible adults may be reluctant to allow testing of a child

without consulting someone not present at the time of your visit (for example, a woman may want to consult her husband before giving permission). In such cases, **make an appointment to return to the household later at an agreed upon time.** If you believe it will help, ask the team supervisor to visit a household where eligible respondents express fear or reluctance to be tested.

Chapter 3. **ANTHROPOMETRY**

Learning objective

- Define anthropometry
- List materials and equipment for anthropometry
- Assembly and disassembly of measuring board
- Complete the appropriate section of the Biomarker Questionnaire related to anthropometry
- Demonstrate measuring weight of adults and children who can stand
- Demonstrate measuring weight of infants
- Demonstrate measuring height of adults and children who can stand
- Demonstrate measuring length of infants

3.A. Introduction

nthropometry refers to the measurement of humans. In the [COUNTRY] DHS, anthropometry refers solely to the measurement of a person's height (length) and weight. This information can be used to assess the nutritional status of a population. For children, standard indices of physical growth related to nutritional status are height-for-age, weight-for-height, and weight-for-age. A child who is below minus two standard deviations (-2 SD) from the median of a reference population in terms of height-for-age is considered short for his/her age or **stunted**. A child who is below minus three standard deviations (-3 SD) from the median of a reference population in terms of height-for-age is considered **severely stunted**. Stunting is a measure of growth faltering and may result from poor diet and recurrent infections or chronic diseases. A child who is below minus two standard deviations (-2 SD) from the median of a reference population in terms of weight-for-height is considered too thin for his/her height or **wasted**. A child who is below minus three standard deviations (-3 SD) from the median of a reference population in terms of weight-for-height is considered **severely wasted**. Severe wasting is used to identify children with severe acute malnutrition. Wasting is a measure of acute weight loss and may result from inadequate food intake, repeated illness or infection. A child who is above two standard deviations (+2 SD) from the median of a reference population in terms of weight-for-height is considered heavy for his/her height, or **overweight/obese**. Overweight/obesity is a measure of excess weight and results from an imbalance between energy consumed (too much) and energy expended (too little). Weight-for-age or **underweight** is a composite index of stunting and wasting that reflects children who are stunted, wasted, or both.

mong adults, height and weight measurement are used to calculate a person's body mass index

(BMI) and to assess a woman's risk of having difficulty during childbirth due to her short stature (height <145 cm). BMI is calculated by dividing the weight in kilograms by the height in meters squared (kg/m^2). BMI values are used to determine the percentage of the adult population that is normal, underweight, overweight and obese.

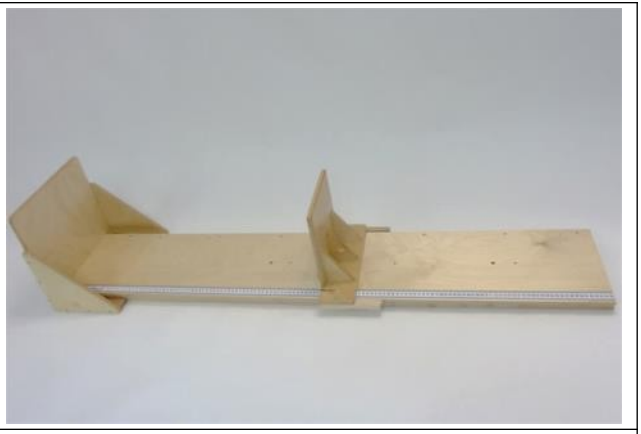
mong adolescents (age 15-19), sex specific BMI-for-age and low height-for-age in girls are calculated. Low height-for-age is used to identify stunted adolescents. These different measurements are used for adolescents because they are still growing, and the timing of peak growth velocity differs in boys and girls. BMI-for-age is a ratio of weight relative to height for different age groups and is used to determine the percentage of the adolescent population that is normal, underweight, overweight and obese.

3.B. Materials and equipment for anthropometry

In addition to the **Biomarker Questionnaire**, the following supplies are needed:

SECA 878 U digital scale[2]: For weighing children and adults. The scale has a 200-kg capacity and weighs in 0.1 kg increments. The scale is powered by six AA batteries and has an "ON-OFF" switch located at the side of the scale.	

[2] The Seca 878 digital floor scale is manufactured by Seca Corporation, Munich, Germany. These instructions were adapted from instructions that accompany the Uniscale and revised by Irwin J. Shorr, MPH, MPS.

Measuring board: For measuring the height (length) of children and adults.	
Standard weight: A standard weight of at least 5 kg is used to check the accuracy of the scales.	
Standard length rod: A rod of a standard height is used to check the accuracy of the measuring board.	

Two paper handouts are available to parents/responsible adults:

1. **Informational pamphlet:** a document designed to inform the parent/responsible adult about anemia, nutrition (and other conditions measured in the survey), including definitions, symptoms, causes, and methods of prevention. In addition, the child's Hb, height, and weight (and other biomarkers measured in the survey) results are recorded and classified within this document. See **Appendix A** for an example of an informational

pamphlet.

2. **Referral for severe acute malnutrition:** Severe acute malnutrition is a life-threatening condition requiring treatment. Children must be referred to a local clinic or health center for further assessment and appropriate care. See **Appendix B** for an example of a referral for severe acute malnutrition.

3.C. Procedures and precautions before measuring height and weight

1. **Layout of the Procedures**: Each step of the measurement procedure is directed at specific participants, who are named in bold letters at the beginning of each step: "**Measurer**" and "**Assistant**".

2. **Two Trained People Required**: Two trained people are required to measure a child's height or length. The **Measurer** holds the child and takes the measurements. The **assistant** helps hold the child and records the measurements in the Biomarker Questionnaire.

3. **Measuring board and Scale Placement:** Be selective about where you place the measuring board and scale. It is best to measure outdoors during daylight hours. If it is cold, raining or if too many people congregate and interfere with the measurements, it may be more comfortable to weigh and measure indoors. Make sure there is adequate light, but not in direct sunlight.

4. The scale should be set up away from electrical appliances including mobile phones.

5. The scale and measuring board should ***always*** be placed on an even and flat surface.

6. The measuring board should ***always*** be supported, look for a wall, table or tree that the measuring board can safely lean against. If there is no support identified, have someone stand behind the measuring board to hold it.

7. **Age Assessment:** Before you measure, confirm the child's age based on Qs. 103 and 104 in the biomarker questionnaire. If the child is less than age 2 years, measure length (the child lying down). If the child is age 2 years or older, measure height (the child is standing). If accurate age is not possible to obtain, measure length if the child is less than 87 cm. Measure height if the child is equal to or greater than 87 cm.

8. **Weigh and Measure One Child at a Time:** If there is more than one eligible child in a household, complete the weighing and measuring of one child at a time. Then proceed with the next eligible child. **DO NOT** weigh and measure all the children together. Instead complete all of the biomarker collection for each eligible child before moving to the next child.

9. If there is more than one eligible woman in a household, collect all the biomarker measurements for which she is eligible. Perform the biomarker collection for all her eligible children before proceeding with the next woman. Collecting biomarkers from the woman (or mother) first, may make the process of collection biomarkers from children easier, especially for anthropometry. Return weighing and measuring equipment to the storage bags after you complete the measurements for each household.

10. **Control the Child:** When you weigh and measure, you must control the child. The strength and mobility of even very young children should not be underestimated. Be firm yet gentle with children. Your own sense of calm and self-confidence will be felt by the parent and the child.

Note: When a child has contact with a measuring board, you must hold and control the child so the child will not trip or fall. Never leave a child alone with a piece of equipment.

11. **Coping with stress:** Since weighing and measuring requires touching and handling children, normal stress levels for this type of survey work are higher than for surveys where only verbal information is collected.

Explain the weighing and measuring procedures to the mother, father, or other responsible adult and to a limited extent, the child, to help minimize possible resistance, fears or discomfort they may feel. You must determine if the child or the parent is under so much stress that the weighing and measuring must stop. Remember, young children are often uncooperative; they tend to cry, scream, kick and sometimes bite. If a child is under severe stress and is crying excessively, try to calm the child or return the child to the parent before proceeding with the measuring.

Do not weigh or measure a child if:

- The parent/responsible adult refuses.
- The child is too sick.
- If the child is distressed, wait and attempt to measure the child once the child calms down.

For children and adults with **physical disabilities**:

- Measure children and adults with physical disabilities and note the disability on the questionnaire. Some individuals' disabilities may make it difficult to stand, straighten their arms, legs, or back, or hold themselves steady. In such cases, adapting the measurement protocols may be required and noted in the questionnaire.

12. **Recording Measurements and Being Careful:** Keep objects out of your hands and pens out of your mouth, hair or breast pocket when you weigh and measure so that neither the child nor you will get hurt due to carelessness. When you are not using a pen, place it in your equipment pack or on the questionnaire. Make sure you do not have long fingernails. Remove interfering rings and watches before you weigh and measure.

13. **Strive for Improvement:** You can be an expert measurer if you strive for improvement and follow every step of every procedure the same way every time. The quality and speed of your measurements will improve with practice. You will be required to measure women, men, and children.

o not take these procedures for granted even though they may seem simple and repetitious. It is easy to make errors when you are not careful. Do not omit any steps. Concentrate on what you are doing.

3.D. Determining eligibility

All eligible, consenting respondents age 0-4 years and 15-[49] years can be measured.

Verbal permission for anthropometry must be obtained. For children age 0-4 years, verbal permission must be obtained from the parent or responsible adult age 18 years or older.

1. The interviewer will identify all children who are potentially eligible for anthropometry based on information collected in the Household Questionnaire and will enter their names and line numbers in Q. 102. They will then enter each child's date of birth and age in Q. 103 and Q. 104, respectively. For children whose mothers were interviewed, this information will come from the tablet report. For children whose mothers weren't interviewed, Q. 103 and Q. 104 will be completed based on information provided by a responsible adult. The interviewer will then complete Q. 105.

   Using information collected in the Household Questionnaire and presented on the table report, the interviewer will complete Q. 202-204 for women age 15-49 and Q. 302-304 for men age 15-[49].

   At this point, the interviewer will hand the Biomarker Questionnaire to the biomarker technician who is responsible for completing the remainder of the questionnaire.

2. Note that for children only, it is possible children will be entered into the Biomarker Questionnaire who are not eligible for measurement. Before completing Q. 106, check Q105, and confirm the child is age 0-4 years. If the child is older than age 0-4 years, there will be an X in the box next to NO, which indicates the child should not be measured. Instead, skip to Q. 125 and go on to the next eligible child.

3.E. Preparing to Take Weight

Before taking any measurements with the scale, cover the second window display facing the respondent. Dark tape can be used. Covering the second display window will reduce errors when recording the weight. For example, a weight of 9.60 kg could be erroneously recoded as 6.90 kg if read upside down in the respondent display window.

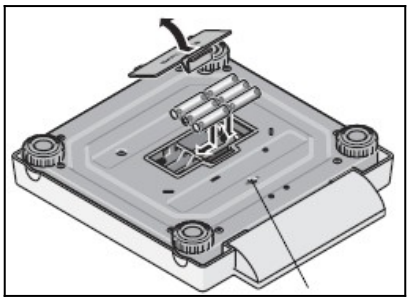
Show the scale (Seca 878 digital scale) to the adult and explain that you will weigh her/him and their children on the scale. Tell her/him that infants and any other children who will not stand on the scale alone can be held by the adult to obtain the child's weight. Ask the adult to wear light clothing while being weighed and to remove shoes/sandals, any heavy clothing, heavy ornaments, items in pockets, etc. To obtain an accurate weight, it is important to remove as much clothing as possible from the child being weighed. Therefore, before beginning, request the caregiver to remove the child's clothing until he/she is wearing only undergarments. Due to cultural preferences or climate, some parents/caregivers may not allow the child to be measured without clothing. To accommodate this preference and maintain accuracy, children may be wrapped in a blanket. The blanket must be weighed prior to weighing the child so wrapping a child in a blanket is only possible if the child is being held.

Preparing the Scale

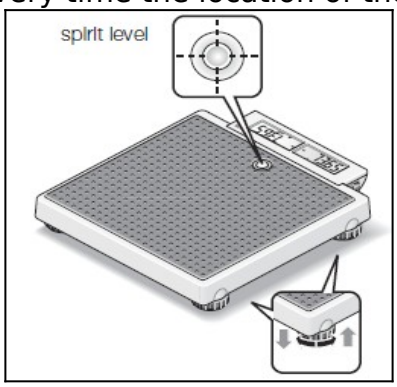
1. **Placement:** Take the scale out of the storage bag and place the scale on a hard, level surface. Uneven surfaces or vibration may cause the scale to malfunction.

Seca 878 scale

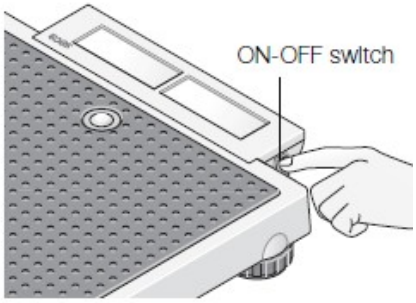
2. **Power supply**: The scale is powered by six AA 1.5 V batteries. To install the batteries, carefully turn over the scale so that the base is accessible. Open the battery compartment and insert the batteries, checking that the polarity of each is correct.

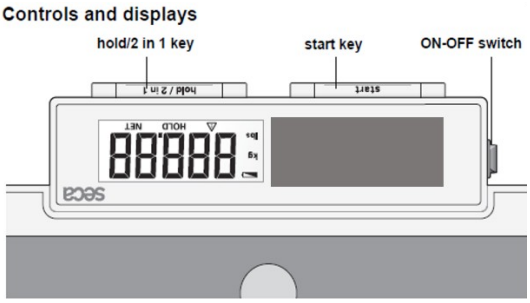


3. **Setting up and aligning the scale**: If the surface is not level, align the scale by turning the foot screws. The air bubble in the spirit level must be in the center of the circle. Ensure that only the feet of the scale are in contact with the floor. The scale itself may not be in contact with the hard surface at any point. The alignment of the base of the scale must be checked and corrected as necessary every time the location of the scale is changed.



4. Power the scale using the ON-OFF switch located at the side of the display window.





Scale functions: The "**Start**" key will start the scale when charged batteries are in place and the ON-OFF switch in ON. There are two displays on the scale. As mentioned above, the display facing the respondent should be covered with tape so that ONLY the display facing the **Measurer** is visible. The "**HOLD**" function will lock the weight in the display so that the **Measurer** can read the weight. The "**2 in 1**" function allows a child who needs to be held by an adult to be weighed.

The scale will not function correctly if it is bumped, knocked or moved during the weighing. It is best to use the scale in the shade or indoors with adequate light if the weather is inhospitable. Handle the scale carefully:

- Start the scale for weighing by pressing the **“START”** key. Press the start key inward, not down. If the scale has no power, push the ON-OFF switch to ON.
- Do not drop or bump the scale.
- Do not weigh a total load of more than 200 kg.
- Do not store the scale in direct sunlight or other hot places.
- Protect the scale against excess humidity or moisture.
- To clean the scale, wipe surfaces with a damp cloth and dry immediately
- Never put the scale in water.
- After using the scale, power the scale OFF using the ON-OFF switch.
- The scale switches off on its own after a certain time:
    - After 3 minutes in Normal mode
    - After 2 minutes in the **“2 in 1”** mode

3.F. Weighing Adults and Children Who Can Stand on the Scale by Themselves

o not set up next to electrical appliances, for instance by a television.

1. If the power supply is not activated, push the power switch to position “ON”. The scale now has power. The display should show “SECA, 8.8.8.8.8 and “0.00.” The scale automatically sets to zero and is now ready for use. Wait for the scale to display the numbers “0.00” before asking the adult or child to step on the scale.

2. Before stepping onto the scale, ask the respondent to remove all keys, mobile phones, etc. from their pockets.

3. Ask the respondent to step onto the center of the scale and stand still. Ask him/her to stand straight without leaning and looking straight ahead. Wait until the numbers are stable on the display window.

https://www.fantaproject.org/sites/default/files/resources/FANTA-Anthropometry-Guide-May2018.pdf

4. After a quick (**Short**) press on the **"HOLD/2 in 1"** key, the **"HOLD"** and a ⚠ appear in the display window; the weight remains frozen until the next weighing operation. Record all digits displayed for the weight.

   - For children, record the child's **weight** measurement in Q. 106. If the child's weight was not measured, record the appropriate code in Q. 106 then skip to Q. 108– as shown below.

106 (4)	WEIGHT IN KILOGRAMS.	KG. ..... ☐☐.☐☐ NOT PRESENT ..... 9994 REFUSED ..... 9995 → 108 OTHER 9996

   - Record if the child is minimally dressed in Q. 107**.** The term "minimally dressed" refers to the child without shoes, heavy ornaments, and undressed down to the underwear or other light weight undergarment. If the child is minimally dressed circle '1' for 'YES.' Circle '2' for 'NO' only if the child is not minimally dressed.

107	WAS THE CHILD MINIMALLY DRESSED?	YES ..... 1 NO 2

   - For adults, record an adult's **weight** measurements in Q. 205/305. If the adult's weight was not measured, record the appropriate code in Q. 205/305, then skip to Q. 207.

205 (3)	WEIGHT IN KILOGRAMS.	KG. ..... ☐☐☐.☐☐ NOT PRESENT ..... 99994 REFUSED ..... 99995 → 207 OTHER 99996

   - Record if the adult was wearing only lightweight clothing in Q. 206/Q306. The term "lightweight clothing" refers to the adult without

shoes, heavy ornaments, and heavy articles of clothing such as thick jerseys and shawls, jackets, and heavy pants or skirts. If the adult is wearing lightweight clothing circle '1' for 'YES.' Circle '2' for 'NO' only if the adult is not wearing lightweight clothing.

5. The "**HOLD**" function can be switched off by a quick (**Short**) press again on the **"HOLD/2 in 1"** key and the "**HOLD**" display vanishes.

3.G. Weighing Infants or Children Who Must be Held by an Adult While on the Scale

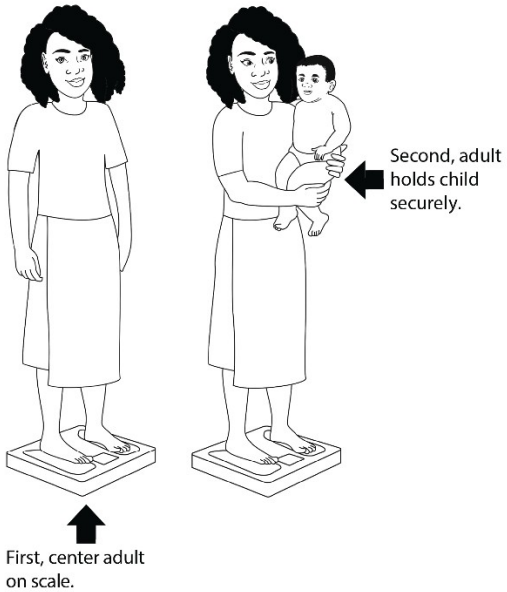
***If Child does NOT NEED to be Covered with a Blanket or Cloth*:**

ote: The adult should be measured separately from the child, recording an adult's weight while measuring a child should not be done to avoid incorrect recording in the Biomarker Questionnaire.

1. Ask the adult to step onto the center of the scale and stand still. Wait until the numbers are stable on the display window.

2. While the adult is still on the scale, press (**Long)** the **"HOLD/2 in 1"** button. The scale returns to **"0.00"** and the **"NET"** appears in the window display.

3. Standing directly in front of the scale, give the child to the adult. The scale will determine the weight of the child even though the adult is on the scale. Once the value for the child's weight is stable for about 3 seconds, the value is retained and **"HOLD",** ⚠ and **"NET"** appear in the display window.

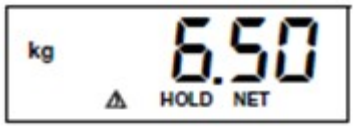


https://www.fantaproject.org/sites/default/files/resources/FANTA-Anthropometry-Guide-May2018.pdf

It is very important to understand the use and difference of a **Long** versus **Short**

press on the "**HOLD/2 in 1**" button. In the above statement, a **Long** press on the **"HOLD/2 in 1"** button is required to activate the **"2 in 1"** function needed to weigh children who need to be held. A **Short** press on the **"HOLD/2 in 1"** button will activate the "**HOLD**" function to freeze and hold the weight measurement on the display of an adult respondent or a child who can stand alone until you are ready to record the result in the Biomarker Questionnaire.

4. Record the weight of the child as displayed on the scale (the scale measures with 100 g resolution) in the Biomarker Questionnaire. The second digit after the decimal will **ONLY** read "0". Thus, a weight of 6.52 kg isn't possible, but a weight of 6.5**0** kg is possible on the scale.



Note: After recording the weight, press the "**Start**" button to reset the scale.

there are other children to be weighed who must be held by the adult, finish all measurements for the first child before moving onto the next.

***If Child NEEDS to be Covered with a Blanket or Cloth*:**

If it is cold and/or the adult wants the child to be covered during the weighing, follow the instructions below carefully:

1. Wait for the scale to display "0.00".
2. Give the adult a blanket or cloth and ask him or her to step on the scale.
3. When the numbers in the display window stabilize, press (**Long**) the "**HOLD/2 in 1**" button. The scale returns to "**0.00**" and the "**NET**" appears in the window display.
4. Give the child to the adult and ask him or her to cover the child with the blanket or cloth.
5. The scale will determine the weight of the child even though the adult is on the scale. Once the value for the child's weight is stable for about 3 seconds, the value is retained and "**HOLD**", ⚠ and "**NET**" appear in the display window.
6. Record the weight of the child as shown on the scale (the scale measures with a 100 g resolution) in the Biomarker Questionnaire. The second digit after the decimal will ONLY read "0". Thus, a weight of 6.52 kg isn't possible, but a weight of 6.50 kg is possible.

For weight measurements, the most frequent causes of errors are:

- Placing the scale on an uneven surface

- Placing the scale near an electronic source, including a mobile device or tablet
- Forgetting to ask the respondent to remove clothing, shoes, and heavy ornaments
- Adjusting the position of the respondent while on the scale
- Incorrectly reading the scale, from a slanted angle or not facing the scale
- Incorrectly recording the weight in the Biomarker Questionnaire

Additional Notes on the SECA scale:

- The SECA scale switches off automatically 3 minutes after the last weighing in the "Normal Mode" or two minutes, if the **"2 in 1"** function is activated.
- Do not weigh loads with a total weight of more than 200 kg.

3.H. Troubleshooting

Possible reasons for the scale not taring (returning to "0.00") after pressing (**Long press**) the **"2 in 1"** key when the adult stands on the scale):

- There was no weight on the scale to tare (i.e., the adult was not on the scale).
- The **"2 in 1"** function was not activated.
- The load weighs more than 200 kg; "**STOP**" appears in the display. If the load is over 200 kg when an adult is holding a child, use an individual of less weight to hold the child.

What to do if the Scale Display Shows the Following Errors:

No weight is displayed when there is a load on the scale?

- Ask the adult to step off the scale, and check to see if the ON-OFF switch at the side of the scale is in the "ON" position.
- Press the **"START"** key to prepare the scale for weighing if the ON-OFF switch is set to ON.
- Check the batteries

The scale keeps switching on while being transported? The **"START"** key has been activated. Turn the power OFF using the ON-OFF switch.

The scale displays a weight after being transported or after new batteries have been put in? Press the **"START"** key; the scale will work normally again.

"*0.00*" does not appear before weighing? Start the scale again by pressing the **"START"** key. There should not be any load on the scale.

"----" appears instead of "*0.00*" before weighing? Start the scale again after it switches off automatically; there should not be any load on the scale.

One segment of the display is illuminated constantly or not at all? There is a

problem with that segment of the scale. Inform your supervisor and use a replacement.

The display shows a battery with split shading? The battery voltage is running low. The batteries should be changed in a few days.

"..*batt*" appears in the display? The batteries are empty. Replace the batteries.

"*STOP*" appears in the display? The maximum load capacity of the scale has been exceeded.

The display flashes? Take the load off the scale and start again. Wait until 0.00 appears and weight again.

Er and a number appear in the display window? Start the scale again after it switches off automatically. The scale should work normally again. If not, turn the ON-OFF switch to OFF and then back to ON. If the scale still does not work properly, inform your supervisor and use a replacement.

3.I. Preparing to measure height/length

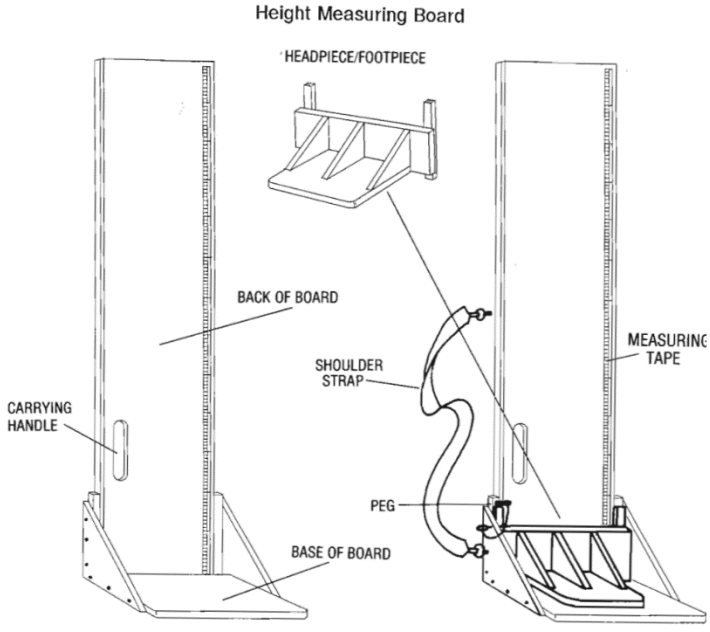
Show the measuring board to the adult and explain that you will use it to measure her/him and the children in the household who are age 0-4 years. Tell her/him that a child less than age 2 years will be measured lying down on his/her back and a child 2- 4 years will be measured standing. Inform her/him even if a child less than age 2 years can stand on his/her own, he/she will still be measured lying down (length). Inform the adult that his/her help will be needed to calm and focus the child.

Preparing the measuring board

1. The measuring board requires assembly. It consists of three separate pieces ("A," "B," and "C") that, for ease of transport, are held together by bolts and a moveable head/footpiece. In transport mode, the measuring board is stored in a case.

2. Remove the measuring board prepared for transport from its case and stand it upright on its base.

3. As you face the board, release the front bolt by turning it counter-clockwise. This will liberate board "C." Set board "C" aside.



4. The second bolt attaching board “B” to base “A” is on the back of base “A.” Turn the second bolt counter-clockwise to liberate board “B.” You now have three separate pieces: A, B, and C.

“**B**

5. To assemble, slide board “B” into base “A” and fasten the clasps at the back of the board. Next, slide board “C” into board “B” and fasten the second set of clasps. Thus, as shown, base “A” is linked to board “B” and board “B” is linked to board “C”.

“**A**”

6. If it is not possible to clasp the boards together, the pieces have been assembled improperly – recheck the instructions and try again.

7. The sliding auto-lock head/footpiece is stored at the base of the measuring board; it can be moved up or down the length of the measuring board and will stay in place wherever it is positioned. Hold the sliding head/footpiece by the center triangle and slide it the length of the assembled board to make sure it is functioning properly.

8. Make sure that the measuring tape is intact, and the numbers are clearly visible.

Note: If taller respondents are not being measured, board “C” should be set aside until needed and the **Measurer** and **Assistant** should use base “A” and board “B” to measure.

3.J. Measuring a child’s height

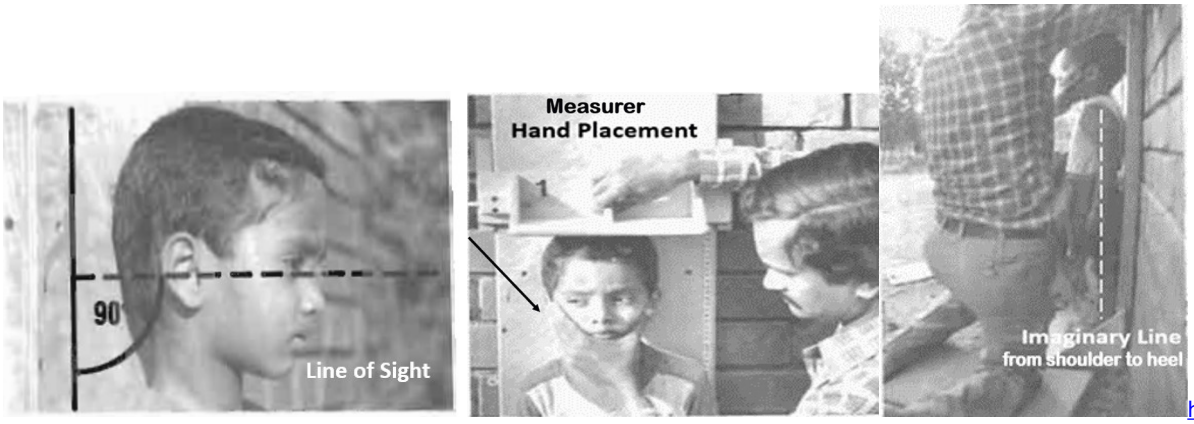
There are two positions that must be exact when measuring a child’s height.

A **line of sight** is required for measuring both length and height. For **height**, imagine there is a line parallel to the ground from the base of the board to the ear through the **lower eye socket.**

An **imaginary line**, running from the shoulder to the heel, is required for measuring height. The imaginary line is required to determine if the feet should be against or away from the back of the board so that the line is perpendicular to the base of the board.

Both the **Measurer** and **Assistant** have **2** responsibilities (the rule of **2**).

Measurer Rule of **2**: **Position child correctly** (Line of Sight and Imaginary Line**)** and **Measurement** (note hand placement around chin).



https://unstats.un.org/unsd/publication/unint/dp_un_int_81_041_6E.pdf

Assistant will 1) hold the legs (knee and shin) and 2) record the measurement.

Assistant Rule of **2**: **Hold the Legs** and **Record** the measurement (note the placement of questionnaire)

https://unstats.un.org/unsd/publication/unint/dp_un_int_81_041_6E.pdf

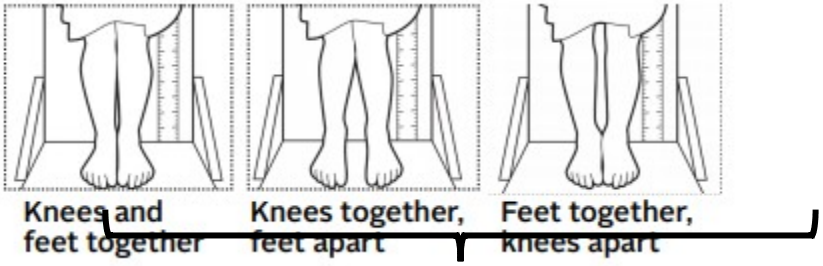
1. **Measurer or Assistant**: Place the measuring board on a hard, flat surface against a wall, table, tree or staircase. Make sure the measuring board is stable. Many walls and floors are not at perfect right angles.

2. **Measurer or Assistant**: Ask the parent to take off the child's shoes and to unbraid hair, remove any hair ornaments, or push aside any hair that would interfere with the height measurement. Ask the parent to bring the child to the measuring board and to kneel in front of the child so that the child will look forward at the parent.

3. **Assistant**: Place the questionnaire and pen on the ground (Arrow 1) and kneel on the right side of the child (Arrow 2).

4. **Measurer**: Kneel on the left of the child (Arrow 3). The measurer should ALWAYS be on the side of the measuring board with the measuring tape.

5. **Assistant**: Place the child's knees and feet in the correct position, with knees and feet either together or apart. There are three possible positions for the knees and feet:



whichever touches first!

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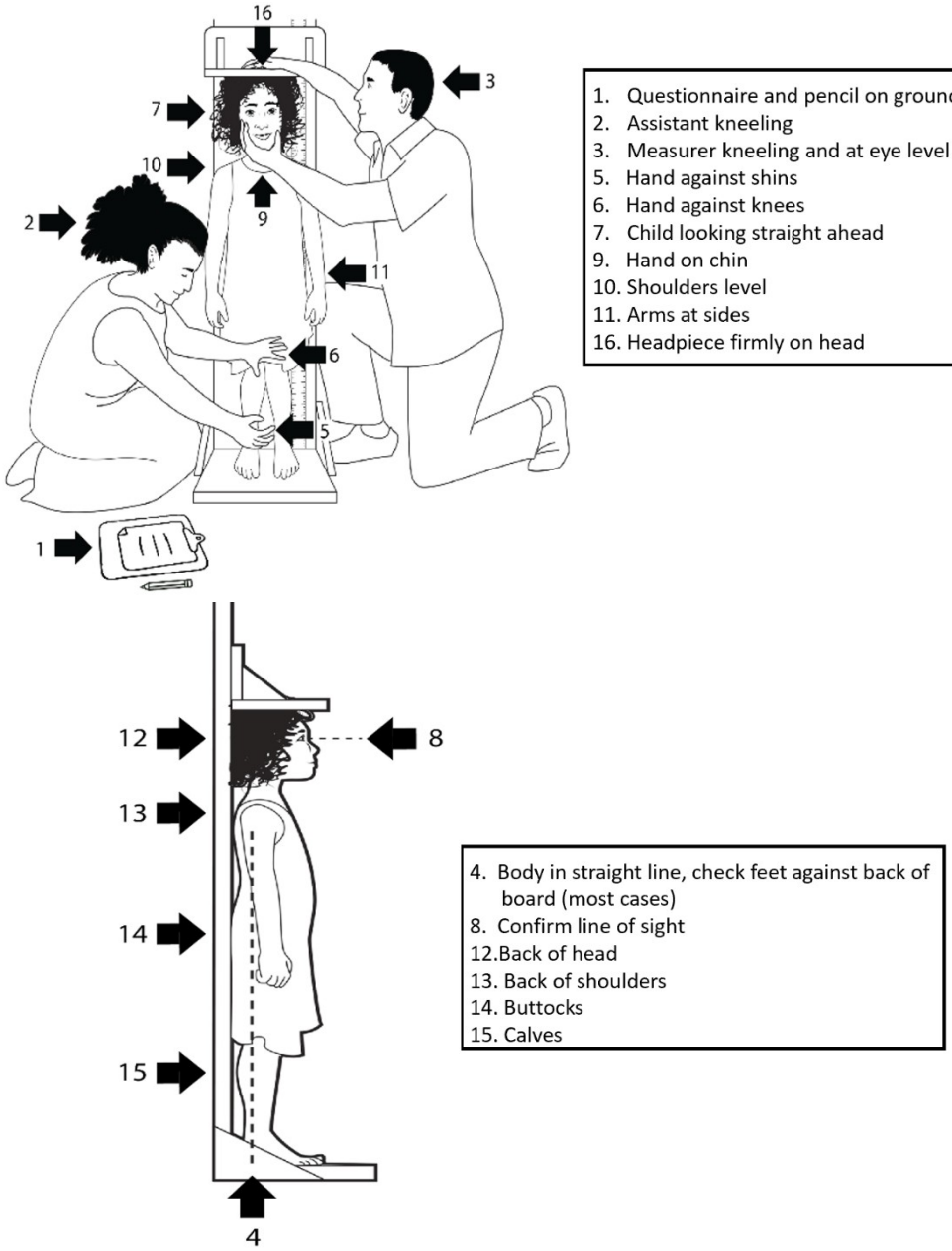
6. **Measurer**: Determine if the child's feet should be against or away from the back of the height board by observing the **imaginary line** drawn from the tip of the shoulder to the heel (Arrow 4). This line should be perpendicular (90° angle) to the base of the height board where the child is standing (the Assistant may have to move the child's feet away from the back of the height board to put them in the proper position).

Note: with most preschool-age children who are not overweight or obese, the heels will probably touch the back of the height board._



1. Questionnaire and pencil on ground
2. Assistant kneeling
3. Measurer kneeling and at eye level with child
5. Hand against shins
6. Hand against knees
7. Child looking straight ahead
9. Hand on chin
10. Shoulders level
11. Arms at sides
16. Headpiece firmly on head

4. Body in straight line, check feet against back of board (most cases)
8. Confirm line of sight
12.Back of head
13. Back of shoulders
14. Buttocks
15. Calves

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7. **Assistant**: With your thumbs against the index finger of each hand, place your right hand on the child's shins (Arrow 5) and your left hand on the child's knees (Arrow 6). Do not wrap your hands around the knees or feet (ankles) or squeeze them together. Make sure the child's legs are straight.

Note: Be sure to avoid gripping the knees which may lead to "wrapping" the knees together rather than pressing them down gently.

8. **Measurer**: Ask the child to look straight ahead at the parent if she is kneeling in front of the child (Arrow 7). Make sure the child's **line of sight** is

parallel to the ground (Arrow 8). Place the thumb and index finger of your left hand on each side of the child's chin, and gradually close your hand (Arrow 9).

Note: with most preschool-age children who are not overweight or obese, the back of the head will touch the back of the height board (Arrow 12); however, if the child is overweight or obese, there will be a space between the back of the child's head and the back of the measuring board. Make sure the child's shoulders are level (Arrow 10), the hands are at the child's side (Arrow 11), and at least the child's buttocks touch the back of the measuring board. Most preschool-age children who are not overweight or obese, the back of the head, the shoulder blades, the buttocks, the calves and heels will touch the back of the measuring board (Arrows 12, 13, 14, 15 & 4).

9. **Measurer and Assistant**: Check the position of the child (Arrows 1-15). Repeat any steps as necessary.

10. **Measurer, then Assistant**: When the child's position is correct, lower the headpiece on top of the child's head (Arrow 16) making sure to push through the child's hair. **Read and call out** the measurement to the nearest 0.1 cm. The **Measurer** should read the measuring tape at eye level. The Assistant will **repeat aloud** the measurement **back** to the **Measurer** and the **Measurer** will **confirm**. The **Measurer** will remove the headpiece from the child's head, his or her left hand from the child's chin, and will allow the child to return to the parent.

11. **Assistant**: **Record** the height measurement in Q. 108. If the child's height was not measured, record the appropriate code in Q. 108 and skip to Q. 113. **Record** that the child was measured standing up in Q. 109. **Show** it to the **Measurer** for confirmation.

108	HEIGHT IN CENTIMETERS. IF CHILD IS AGE 0-1 YEARS, MEASURE LYING DOWN. IF CHILD IS AGE 2, 3, OR 4 YEARS, MEASURE STANDING UP.	CM. . . . . ☐☐☐.☐ NOT PRESENT . . . . . 9994 REFUSED . . . . . 9995 OTHER 9996	→ 113
109	WAS THE CHILD MEASURED LYING DOWN OR STANDING UP?	LYING DOWN . . . . . 1 STANDING UP 2	

- Record in Q.110 whether the correct measurement procedure was followed based on the child's age Q.104 and how the child was measured Q.109. If the child was measured standing up and they are 2 years or older record 'YES' and skip to Q.112. Record 'NO' if the child was measured standing up but they were less than two years old

Note: It is important to record how the child was actually measured in Q. 109

whether or not they were supposed to be measured lying down or standing up. This question is not a reflection of whether you as a measurer performed the correct procedure. When a child is measured lying down the child will on average be slightly taller than if he/ she was measured standing up. Thus, information on the child's position during measurement is important later when calculating nutritional status.

- If the child was not measured following correct procedures, the reason for this should be recorded in Q. 111. While you should do your best to follow the correct measurement procedures, there are times that this may be impossible. For example, the child has a disability or refuses to stand. Whatever the reason, it should be recorded in Q. 111.

- Record in Q. 112 whether braided or ornamented hair interfered with the measurement. Record 'YES' if the hairstyle or ornamented hair could not be pushed apart or manipulated to allow the headpiece to rest on the top of the head. Record 'NO' only if braided or ornamented hair did not interfere with the measurement.

110	CHECK 104 AND 109: BASED ON CHILD'S AGE, WAS CORRECT MEASUREMENT PROCEDURE FOLLOWED?	YES ..... 1 NO 2	→ 112
111	IF CHILD IS AGE 0-1 YEARS: WHY WAS (NAME) MEASURED STANDING UP? IF CHILD IS AGE 2-4 YEARS: WHY WAS (NAME) MEASURED LYING DOWN? _____ _____		
112 (5)	WAS THE RECORDED MEASUREMENT INTERFERED WITH BY BRAIDED OR ORNAMENTED HAIR?	YES ..... 1 NO 2	

12. **Measurer**: Check the recorded measurement on the questionnaire for accuracy and legibility. Instruct the Assistant to correct any errors. Mark your fieldworker number in Q. 113.

13. **Assistant:** Mark your fieldworker number in Q. 114 and enter the date the measurement was taken in Q. 115.

3.K. Measuring a child's length

For children less than age 2 years, both the **Measurer** and **Assistant** have **2** responsibilities (the rule of **2**). The **Measurer** will 1) press the child's knees/shins down and 2) take the measurement. The **Assistant** will 1) position the child correctly for the proper line of sight with the head against the board and 2) record the measurement. Do not switch roles.

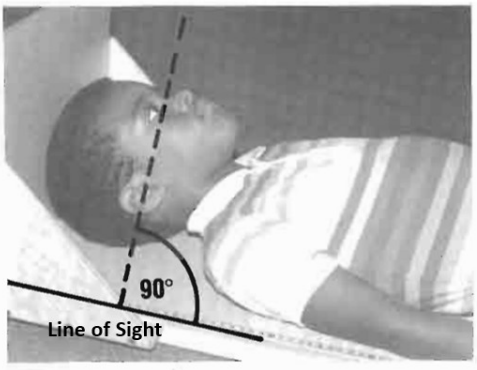
Measurer Rule of **2**:

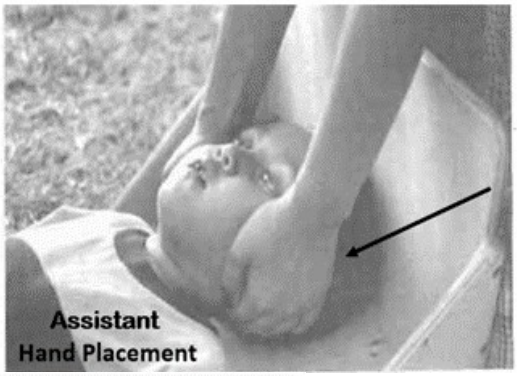
- **Presses Knees/Shins**
- **Measurement**

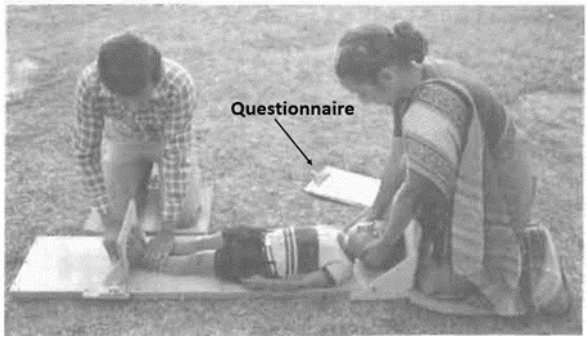
https://unstats.un.org/unsd/publication/unint/dp_un_int_81_041_6E.pdf

Assistant Rule of **2**:

- **Line of Sight, head against back of board,** note the placement of the hands
- **Record** the measurement (note the placement of questionnaire)







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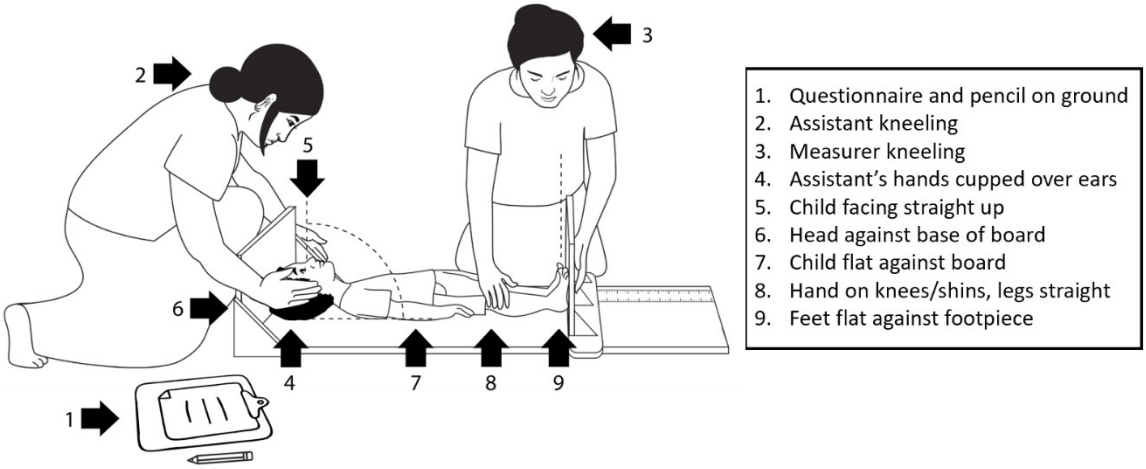

1. Questionnaire and pencil on ground
2. Assistant kneeling
3. Measurer kneeling
4. Assistant's hands cupped over ears
5. Child facing straight up
6. Head against base of board
7. Child flat against board
8. Hand on knees/shins, legs straight
9. Feet flat against footpiece

https://www.fantaproject.org/sites/default/files/resources/FANTA-Anthropometry-Guide-May2018.pdf

1. **Measurer or Assistant:** Place the measuring board on a hard, flat surface, such as the ground or floor. Make sure the measuring board is stable.

2. **Assistant:** Place the questionnaire on the ground, floor or table (Arrow 1) and kneel behind the base of the measuring board if it is on the ground or floor (Arrow 2).

3. **Measurer:** Kneel on the side of the measuring board with the measuring tape (at the child's feet) so that you can move the foot piece with your right hand (Arrow 3). The measurer should ALWAYS be one the side of the measuring board with the measuring tape.

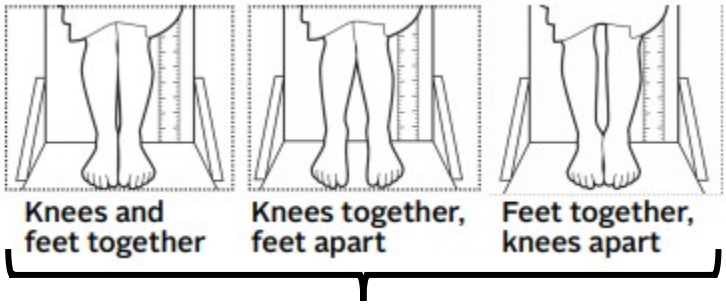
4. **Measurer and Assistant:** With the help of the parent, gently lower the child onto the measuring board, making sure the measurer supports the child at the trunk of the body while the assistant supports the child's head.

5. **Assistant:** Cup your hands over the child's ears (Arrow 4). With your arms straight place the child's head against the base of the board. The child should be looking straight up (Arrow 5) so that the **line of sight** is perpendicular to the board. Your head should be directly over the child's head. Watch the child's head to make sure it is in the correct position against the base of the board (Arrow 6). Confirm the line of sight by looking at the profile of the child lying down. Again, an imaginary line should be drawn from the ear to the lower eye socket.

6. **Measurer:** Make sure the child is lying flat in the center of the board (Arrow 7).

Place the child's knees and feet in the correct position, with knees and feet either together

or apart. There are three possible positions for the knees and feet:



whichever touches first!

https://www.fantaproject.org/sites/default/files/resources/FANTA-Anthropometry-Guide-May2018.pdf

With your thumb against your index finger, place your left hand on the child's knees (Arrow 8) and press them gently, but firmly against the board. Do not wrap your hand around the knees or squeeze them together. Make sure the child's legs are straight.

Note: It is not possible to straighten the knees of a newborn to the same degree as older children. If the child is agitated and both legs cannot be held in position, measure with one leg in position.

7. **Measurer:** Check the position of the child (Arrows 1-8). Repeat any steps as necessary.

8. **Measurer, then Assistant:** When the child's position is correct, move the foot piece with your right hand until it is firmly against the child's heels (Arrow 9). Read the measurement to the nearest 0.1 cm and **call out** the measurement to the **Assistant**. The **Assistant** will **repeat** the measurement and the **Measurer** will **confirm**.

9. **Assistant:** Record the **height** measurement in Q. 108. If the child's height was not measured, record the appropriate code in Q108 and skip to Q. 113. Record that that the child was measured lying down in Q. 109. Show it to the Measurer for confirmation.

    - Record in Q. 110 whether the correct measurement procedure was followed based on the child's age Q. 104 and how the child was measured Q. 109. If the child was measured following correct procedures record 'YES' and skip to Q. 112. Record 'NO' only if the child was not measured following correct procedures.

    - If the child was not measured following correct procedures, the reason for this should be recorded in Q. 111. For example, a child age 0-1 may have refused to lie down and so was measured standing up.

- Record in Q. 112 whether braided or ornamented hair interfered with the measurement. Record 'YES' if the hairstyle or ornamented hair could not be pushed apart or manipulated to allow the headpiece to rest on the top of the head. Record 'NO' only if braided or ornamented hair did not interfere with the measurement.

10. **Measurer:** Check the recorded measurement on the questionnaire for accuracy and legibility. Instruct the Assistant to correct any errors. Mark your fieldworker number in Q. 113.

11. **Assistant**: Mark your fieldworker number in Q. 114 and enter the date in Q. 115.

3.L. Measuring an adult's height

The height of adults can be taken by one person alone, the **Measurer.** However, an **Assistant** can be used to record the measurement.

Measurer: Place the measuring board on a hard, flat surface against a wall, table, tree or staircase. Make sure the measuring board is stable. Many walls and floors are not at perfect right angles.

1. **Measurer:** Ask the person to take off his/her shoes and ask him/her to unbraid or push aside any hair that would interfere with the height measurement. Ask the person to stand on the base of the height measuring board and to face forward.

2. **Measurer:** Place the questionnaire and pen on the ground and stand on the left-hand side of the person (the same side as the measuring tape).

3. **Measurer:** Determine if the person's feet should be against or away from the back of the height board by observing the **imaginary line** drawn from the tip of the shoulder to the heel (Arrow 1). This line should be perpendicular (90° angle) to the base of the height board where the person is standing. Note that with almost all adults, the measurer will have to move the person's feet away from the back of the board to put them in the proper position; (Arrow 2).

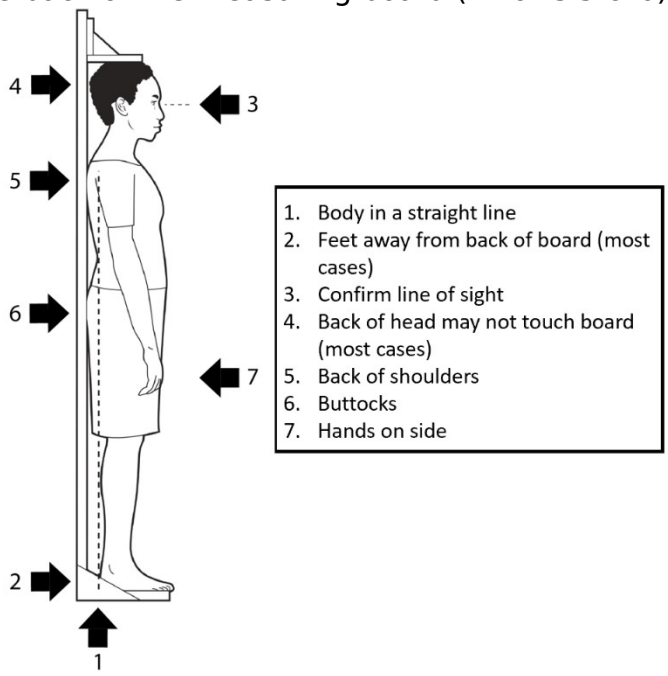
4. **Measurer:** Place the knees and feet in the correct position, with knees and feet either together or apart. There are three possible positions for the knees and feet:

    - Knees together and feet together
    - Knees together and feet apart } whichever touches first!
    - Knees apart and feet together

5. **Measurer:** Ask the person to look straight ahead. Cup the respondent's chin between the thumb and index finger of your left hand and gradually close your hand. Position the person's head so that the **line of sight** is parallel to the ground (Arrow 3).

With most adults, the back of the head will not touch the back of the Measuring board —there will be a space between the back of the person's head and the back of the measuring board (Arrow 4). After you have placed the person's head in the proper position, release your hand from the person's chin and ask him/her to hold his/her head in the position you have just placed it in.

Make sure the person's shoulders are level, the hands are at the person's side (Arrow 7), and at least the buttocks touch the back of the measuring board. Note that with most adults, only the buttocks and perhaps the shoulder blades, will touch the back of the measuring board (Arrows 5 & 6).



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6. **Measurer:** Check the position of the person. Repeat any steps as necessary.

7. **Measurer:** When the person's position is correct, lower the headpiece on top of the head making sure to push through the person's hair. Read and call out the measurement to the nearest 0.1 cm. Remove the headpiece from the person's head and escort the person off the height board.

Note: The tape should be read at eye level. If a respondent is taller than the **Measurer**, the **Measurer** will need to stand on a chair to read the tape at eye level; alternatively, they may need to bend down or kneel if the respondent is shorter than the **Measurer**.

Measurer: Immediately record the measurement on the questionnaire. Record an adult's height measurements in Q. 207/307. If the adult's height was not measured, record the appropriate code in Q. 207/307 and skip to Q. 209/309.

Measurer: Record in Q. 208/308 whether braided or ornamented hair interfered with the measurement. Record 'YES' if the hairstyle or ornamented hair could not be pushed apart or manipulated to allow the headpiece to rest on the top of the head. Record 'NO' only if braided or ornamented hair did not interfere with the measurement.

8. **Measurer:** Check the recorded measurement on the questionnaire for accuracy and legibility. Correct any errors. Enter your fieldworker number in Q. 209/309. If there is an Assistant, enter their fieldworker number in Q. 210/310 or mark 9999 if there is no Assistant. Enter the date of measurement in Q. 211/311.

For length/height measurements, the most frequent causes of errors are:

- Incorrectly positioning the body on the measuring board leading to an invalid **imaginary line** (shoulder to heel)
- Invalid **line of sight** (ear to lower eye socket)
- Incorrect positioning of the head/footpiece
- Incorrectly reading the measurement and not having ones' eye perpendicular to the measuring tape
- Incorrect recording of length/height on the Biomarker Questionnaire
- The **Measurer** and **Assistant** not following the rule of **2**

3.M. Dismantling the measuring board

1. Stand the measuring board upright and step on the base with one foot to stabilize it.

2. Slide the head/foot piece into the base, "A."

3. Release the clasp on the back of both boards, "B" and "C." Put the clasp flat against both the boards.

4. Stand the base, "A," and place the back of board "B" against base "A." This should result in the measuring tape on board "B" facing you.

5. Make sure all sides, corners and extension pieces are straight and in line with each other. Once this is done, push the bolt behind base "A" into board "B" and screw it clockwise to secure.

6. Take board "C" and place it against board "B" so that the measuring tape on board "C" is facing inward to board "B."

7. Make sure all sides, corners and extension pieces are straight and in line with each other. Once this is done, push the bolt on board “C” into board “B” and screw it clockwise to secure.

8. In this arrangement, board “B” should be in between base “A” and board “C.” Board “C” should be facing you without the measuring tape showing.

3.N. Quality assurance for anthropometry

Errors in the precision and accuracy of height/length and weight measurements affect the validity of the indices derived from these measurements. Two types of errors can occur: random and systematic measurement errors. These errors commonly arise from inadequate training, instrument error, and improper recording of measurements. These errors can be minimized by training personnel to use standardized, validated measurement techniques and instruments that are precise, accurate, and correctly maintained.

In the [YEAR] [COUNTRY] DHS, accuracy and precision of height and weight measurements will be ensured by regular checking of the accuracy of measuring equipment and standardization of biomarker technicians. This process of standardization must be completed during training[3] and prior to main field work.

Inventory of equipment

Inventory of equipment is conducted during training and during fieldwork.

During training, it is important to:

1. Ensure that all measuring boards are functioning well and are not broken.
    a. All the measuring boards are given a unique identification number.
    b. Check measuring boards for loose screws, loose clamps, cracks, and damaged head pieces.
    c. Measure a rod of standard height on each of the boards. For each board, record the measurement in a table comparable to the one shown below.

Date: MM/DD/YYYY

Inventory of NEW Measuring Boards		
Board ID	**Measurement in cm**	**Condition**

2. Ensure that all weighing scales are functioning well and are not broken.

[3] The standardization process should take place during the pretest/training of trainers and the main training of the field staff.

a. All scales are given a unique identification number.
b. Weigh an object of standard weight on the weighing scales. For each scale, record weight measurements in the table comparable to the one shown below:

Date: MM/DD/YYYY

Inventory of NEW weighing scales		
Scale ID	Measurement in kg	Condition

ll the weighing scales that indicate correct weight are given a unique identification number.
nly measuring boards and scales that correctly measure the rods and scales will be used during fieldwork.

uring fieldwork, daily checks are required to ensure the accuracy of the measuring boards and scales during field work. The check should be done using a rod of known length and an object with a constant weight every morning before fieldwork begins. Teams should complete the fieldwork equipment maintenance log for the measuring boards and scales as shown below. See **Appendix C** for the complete fieldwork equipment maintenance logs for measuring boards and scales.

IELDWORK DAILY MAINTENANCE LOG - MEASURING BOARD

Equipment ID	Date (DD/MM/YYYY)	Cluster Number	Measurement in cm	Condition/Remarks	Not in use (check)	[Fieldworker] number
001	04/08/2020	1	110.1	Fine		123
001	05/08/2020	1	110.1	Fine		123
001	06/08/2020	1	110.0	Fine		123

FIELDWORK DAILY MAINTENANCE LOG - WEIGHING SCALE

Equipment ID	Date (DD/MM/YYYY)	Cluster Number	Measurement in kg	Condition/Remarks	Not in use (check)	[Fieldworker] number
001	04/08/2020	1	4.90	Fine		123
001	05/08/2020	1	4.80	Fine		123
001	06/08/2020	1	4.90	Fine		123

It is ok for there to be some minor fluctuations in the daily measurements. For the rods and scales acceptable fluctuations are +/- 0.5 cm and +/- 0.50 kg, respectively.

If equipment is malfunctioning, all height/length and weight measurements should **stop** until the implementing agency provides new equipment. The team supervisor should contact the field coordinator immediately and request a replacement.

Remeasurement of children

Obtaining accurate height and weight measurements especially for young children is difficult. Even small measurement errors can result in invalid data. Special procedures that require biomarker technicians to conduct remeasurements of specific children before the teams leave the cluster have been put in place to improve the data quality.

Completed Biomarker Questionnaires will be entered into the CAPI system. The team supervisor will run a program to identify children who are eligible for remeasurement. Children are eligible for remeasurement for two reasons:

1. Their first height and weight measurements are so extreme that the measurements are almost certainly invalid.
2. They are randomly selected. About 1 in 10 households will have a child randomly selected for remeasurement regardless of whether their first anthropometry measurement was acceptable.

The biomarker team will receive a Remeasurement Questionnaire from the team supervisor with the name, line number, and date of birth of the child filled in. The biomarker team will also receive an informational pamphlet to record the remeasurements. The biomarker team must return to the household(s) to remeasure eligible child(ren). Only children eligible for remeasurement should have their height and weight remeasured, the other children in the household do not need to be remeasured.

The biomarker teams should return the completed Remeasurement Questionnaires to the team supervisor for data entry.

Wasting Referral

During data collection, children's' weight-for-height Z-scores are calculated in CAPI. This information is only available in CAPI surveys. The CAPI program will provide information on the children who have severe acute malnutrition (a Z-score of less than -3 for weight-for-height). The information can be accessed by the survey team only after the completion of the children's height and weight measurements and remeasurements. The biomarker technician or the team supervisor should provide a severe acute malnutrition referral form to the parent/responsible adult of a child identified with severe acute malnutrition. A completed form will contain the name, height (cm), weight (kg), and weight-for-height (Z-score) result of the severely acute malnourished child (defined as a Z-score of less than -3 for weight-for-height). See **Appendix B** for an example of a severe acute malnutrition referral form.

The parent/responsible adult should be informed about the effects of severe acute malnutrition and instructed to take the child to a local clinic or health center to ensure the child receives proper assessment and treatment for severe acute malnutrition. The parent/responsible adult should be instructed to take the referral form with them when they go to the clinic or health center.

3.O. Standardization of height and length measurements

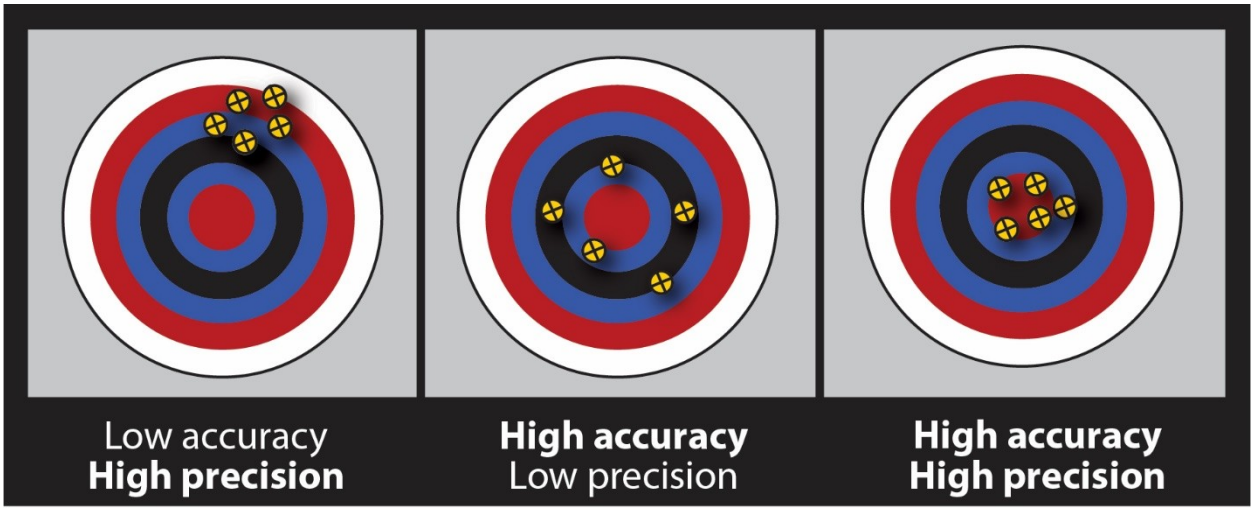
Once all biomarker technicians have adequately practiced the measurement and recording techniques, and feel comfortable with their performance, **standardization exercises must be carried out on children 0-59 months** to assess the biomarker technicians' accuracy and precision (Figure 1).

Accuracy means how close a measured value is to the actual (true) value. In the standardization exercise, the true value is the average of two measurements made by the trainer (gold standard). The measurer will make two measurements on the same children as the trainer and his or her average measurement will be compared against the true value to assess accuracy.

Precision means how close the measured values are to each other. In the standardization exercise, the measurer's two measurements from the same child will be compared to each other assess precision.

The technical error of measurement (TEM) is used to assess the measurers' precision and accuracy across the 10 children. Each measurer must pass the standardization exercise on both precision and accuracy. The criteria for passing has been established by WHO/UNICEF (https://www.who.int/nutrition/publications/anthropometry-data-quality-report/en/). Height or length measurement acceptable TEM is <0.6 cm for precision and <0.8 cm for accuracy. The TEM is generated based on the sum of the average differences between measurements over total number of children measured. The more outliers (in either direction), the greater will be the TEM.

Fig. 1 Illustration on accuracy and precision



Procedures for the standardization exercise are provided in **Appendix D**.

Chapter 4. **CAPILLARY BLOOD COLLECTION**

Learning objectives

- List supplies for blood collection
- Determine the site of blood collection for the appropriate age group
- List steps involved in obtaining a capillary blood sample from the finger
- Perform steps involved in obtaining a capillary blood sample from the finger
- List steps involved in obtaining a capillary blood sample from the heel
- Apply steps involved in obtaining a capillary blood sample from the heel
- List best practices and precautions to observe when collecting blood

4.A. Introduction

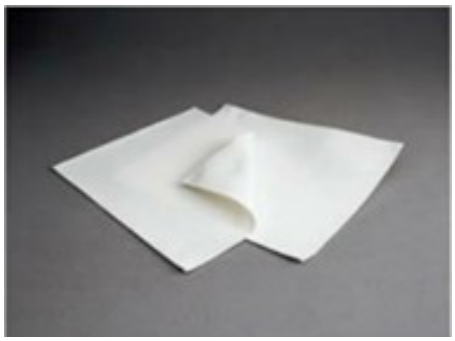
This chapter describes the materials needed for and, the steps involved in, capillary blood collection.

Capillary blood will be collected as part of the survey to test for anemia. Capillary blood can be obtained from the palm side of the tip of a finger or from a heel. For adults and children age 12 months and older, a finger should be used. For children less than age 12 months, the heel should be used. For children who are undernourished or skinny a heel puncture is also recommended because the finger tissue can be thin, and the lancet may pierce the bone.

4.B. Materials and supplies for performing finger or heel pricks

The capillary blood drops collected for biomarker testing will be drawn from a finger or heel. The following supplies and materials will be used in performing the finger or heel prick.

Disposable latex gloves: Used to reduce the risk of bloodborne diseases. Gloves must be worn by the biomarker technician and by anyone else who may assist with the blood collection.	

Absorbent paper sheets: The surface area where your supplies will be placed while you collect the blood. Place the plastic/shiny side of the absorbent sheet face down (the absorbent side without plastic on it should be facing up).	
Alcohol preps: Used for cleaning the skin prior to pricking the finger or heel.	
Safety lancets: The lancet is a single-use, disposable device used to prick the fingertip or heel. The needle is retractable; when the trigger is pressed, a surgical blade quickly protrudes from the device, punctures the skin, and then automatically retracts.	

Sterile gauze pads: Used to wipe away the first drop(s) of blood to stimulate capillary blood flow.	
Adhesive bandages: Applied to the puncture site to minimize the risk of infection.	
Biohazardous waste bags: Plastic bags that are provided to hold all the biohazardous waste generated during the day except sharps. All waste bags are labeled with “biohazard” logo.	
Sharps containers: All biohazardous sharps that have pointed tips such as lancets and microcuvettes, [as well as capillary blood collection devices.]	

4.C. How to put on gloves

Donning (putting on gloves)

1. Measure your hand using the glove-sizing chart before choosing a glove to reduce the potential for tearing.
2. If possible, thoroughly wash hands before donning gloves and after each glove change.
3. Open glove at the cuff and extend opposite hand until thumb crotch is to the cuff of the glove.
4. Once the hand is properly aligned in the glove, move your fingers down into the glove's fingers.
5. Roll the cuff of the glove down the wrist until the glove is secure.
6. Replace gloves frequently, including whenever changing tasks.

Doffing (taking off gloves)

1. Pull the glove from above the cuff up on the hand inside out to trap potential contaminants inside the used glove.
2. Place the used glove into the palm of the opposite hand (which remains gloved).
3. Repeat step 1 on the opposite hand, trapping the first glove inside the second.
4. Discard gloves and wash hands.

4.D. Steps in obtaining capillary blood from the finger

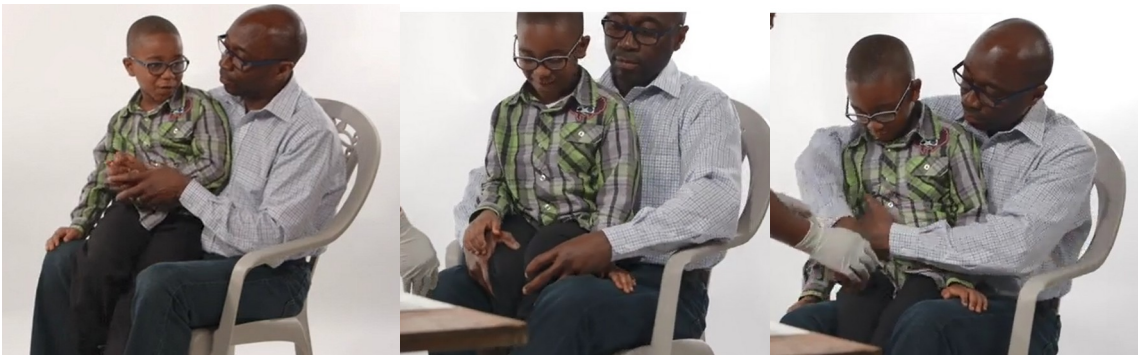
The following steps describe how to obtain a capillary blood drop sample from the finger. They apply to the collection of samples from adults and children age 12 months and older. Remember, the informed consent statement must be read, and consent must be granted, for each eligible adult respondent or parent/guardian of each eligible child before blood collection.

Preparing the session

1. If possible, find an **indoor site** to encourage privacy. The site should have a table or other furniture with a flat surface where you can lay out the supplies. A couch, bed, or mat should be readily available if the respondent feels faint and needs to lie down. If you must do the testing outdoors, find a site in the full shade and away from rain, dust, and other environmental elements that might affect the sample.
2. **Describe to the respondent exactly what will be done during blood collection. For children, describe to the parent or responsible adult exactly what will be done** during the collection of the blood sample and how they can assist by holding the child on their lap and holding the child’s hand during the collection of the sample.

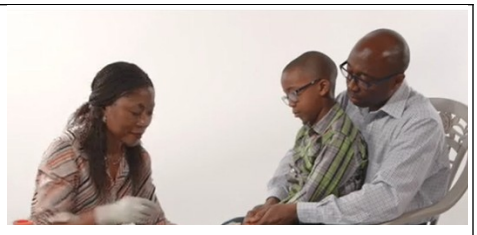
3. When collecting blood from a child, note that the child may be fearful or anxious about what is going to happen. Therefore, using a calm and reassuring manner is important as you begin to collect the blood sample. Remember that nonverbal communication is important, so maintain eye contact with the child as you prepare to take the sample. Encourage the parent/responsible adult to hold the child on his or her lap and place the child's legs in between his or hers so that the child does not kick the table and place his or her arms around the child.

Figure 3-1. How a parent should hold a child for a finger prick.

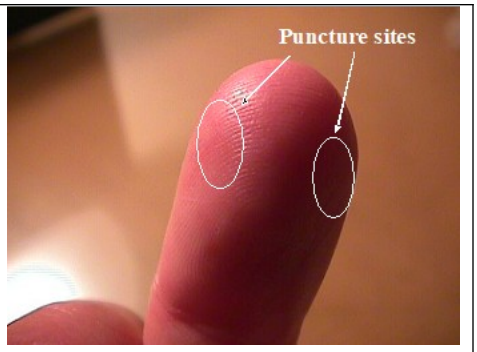


1. **Put on gloves** before beginning the collection of the blood sample from the first respondent.

2. **Kneel on the side of the respondent opposite to the hand/heel from which you will collect blood.** For example, if you want to collect the sample from the left hand, place yourself to the right side of the respondent. Do not sit on a chair.



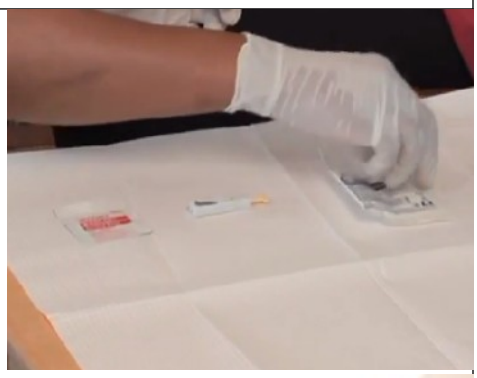
3. **Use the third or fourth finger for collecting blood.** Do not use a finger with a scar, a wound or cut, swelling, a deformity, a rash, or an infection. Also do not use a finger on which the respondent is wearing a ring, because the ring may disrupt the free flow of blood to the tip of the finger. You can ask the respondent to remove the ring.

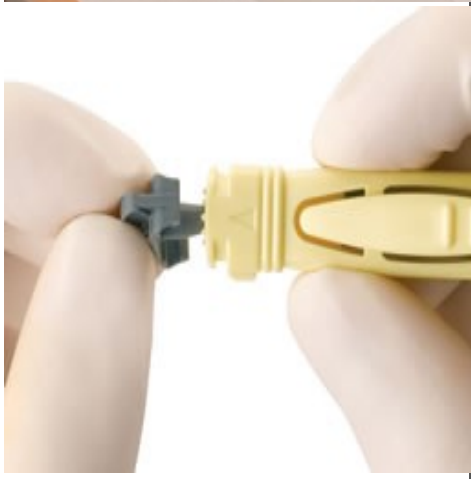


4. **Ask the adult respondent to briskly rub his/her hands together to warm the fingers.**

For children, ask the parent/responsible adult to warm the child's hand by briskly rubbing the child's fingers in between their palms.

5. **Set up your station:**
   - Take out a clean absorbent paper sheet and spread the shiny side down over a flat surface where you will lay out your supplies.
   - Open the sterile gauze package. Separate the two pieces of gauze and lay them down on the package so they do not touch the absorbent pad.
   - Open the outer package of the adhesive bandage. Place the bandage on the packaging. Open the alcohol prep package.
   - Remove the blade slot cover of the lancet. Prepare the lancet for use. Simply twist the blade slot cover 360° until the cover comes out. Do not remove the blade slot cover from the lancet other than as instructed here, as this may damage the lancet and cause it to malfunction.





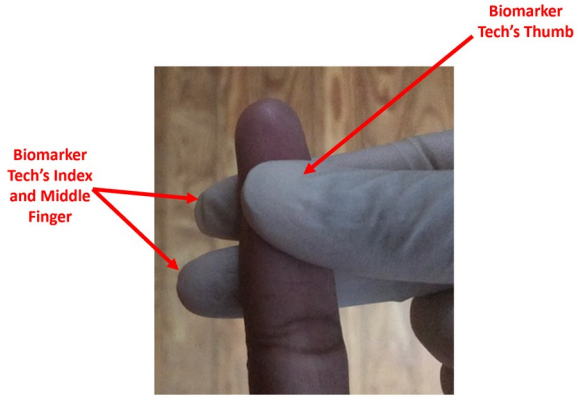
6. **With an alcohol prep pad, clean the skin of the finger or heel thoroughly.** If the skin is dirty, use a second pad. Clean the finger before pricking.	
7. **Allow the finger or heel to air dry completely. Do not blow on the area to dry the alcohol.** Blowing may allow bacteria to contaminate the site. Allow the alcohol to air dry. If the finger is not properly dry, you run the risk of mixing alcohol with the blood. It takes 15-20 seconds for the alcohol to dry. If the alcohol used to clean the puncture site mixes with the blood, it can cause hemolysis of the sample leading to errors in the test results.	
8. **Position the hand palm side facing up.** Form a pad with your index and middle finger behind the base of the respondent's middle finger and your thumb in front of the respondent's finger.	

9. **Using a rolling movement of your thumb, push blood from the base of the finger to the tip.** This action will stimulate a flow of blood to the fingertip.

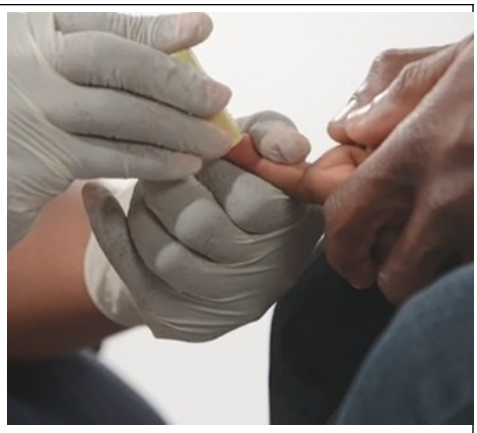
For children, it may be helpful if the parent or responsible adult assists you by holding the child's hand.

Note: Never "milk" the finger. Milking is excessive massaging or squeezing of the finger, which will cause tissue juice to mix with and dilute the blood. This will result in erroneous test results, specifically, a lower Hb concentration. Instead, the biomarker technician should employ only mild pressure by using the thumb and the index and middle fingers to support the base of the finger.

Figure 3-2. How to hold the finger for a finger prick.

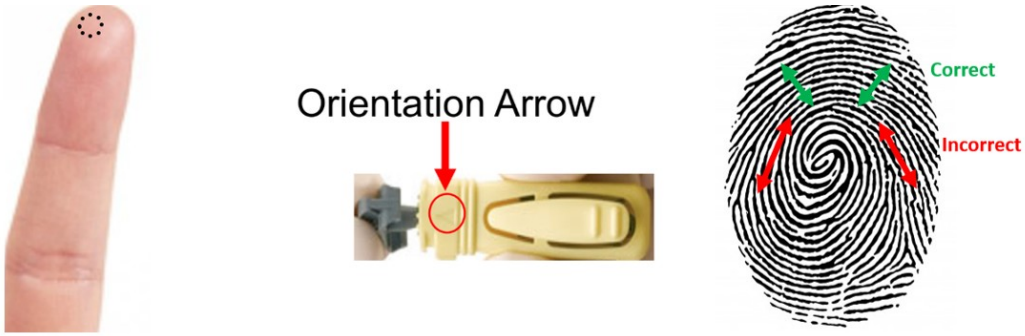


This position will make the connective tissue underlying the skin more porous and allow the capillary blood to flow easily after the incision.

10. **Place the lancet firmly against the skin with the trigger facing up**, so that the arrow on the lancet is visible and pointing towards the prick site. Use the lancet to **prick the skin** by placing the blade-slot surface against the area and pressing the trigger. (The tip of the blade ejects through the blade slot, producing a micro-incision in the skin, and immediately retracts into the device.) After pricking the skin, drop the used lancet into the Sharps container.	

Note: Avoid placing the lancet on the very tip of the finger or the sides beyond the palmar area or you will risk piercing the underlying bone. You can first place and press the lancet into the finger without pushing the trigger. The lancet is equipped with "teeth" that will indent the skin to demonstrate where the puncture will occur. Re-adjust the placement of the lancet if needed. Using the arrow on the lancet, be sure to pierce the skin perpendicular and not parallel to the fingerprint pattern. Pricking the finger perpendicular to the fingerprint pattern will allow the blood drop to form on the surface of the finger and not drip down the side.

Figure 3-3. How a position the lancet to prick the finger.



11. When your thumb reaches the fingertip, maintain a gentle pressure to **trap the blood in the fingertip**.	
12. **When the blood appears, use a sterile gauze pad to wipe away the first and second blood drops.** Collect the third blood drop for anemia testing.	
13. **When blood collection is completed, apply a piece of sterile gauze at the prick site to stop the blood flow.**	

14. **Apply an adhesive bandage to the prick site.**	
15. **Discard all materials used in the blood collection procedure in a labeled biohazardous waste bag.**	

4.E. Obtaining capillary blood from a child's heel

The heel is the puncture site for children age 6 - 11 months, or malnourished (skinny) children whose fingers are very thin. A lancet that punctures to a depth of 1.8 – 2.0 mm will be used to puncture the heel. The following describes the steps that are involved in obtaining a capillary blood drop from the heel.

1. **Prepare to prick** outside an imaginary line drawn from the middle of the big toe to the heel or outside an imaginary line drawn from the area between the fourth and fifth toes to the heel. Take care to avoid the central area of the foot (to avoid injury to the nerves and tendons) or the center of the heel (to avoid piercing the heel bone).	
2. **Hold the heel firmly.** Apply moderate pressure near the puncture site by wrapping the heel using your thumb and second finger. 3. **Clean the site with an alcohol prep.** Make sure the site is dry before puncturing the skin with the lancet. In selecting a puncture site, avoid any areas of the skin that are broken or infected.	
4. **Place the blade-slot surface against the skin and press the trigger.** Ensure the free flow of blood.	
5. When the blood appears, use **a sterile gauze pad to wipe away the first two drops of blood**, use the third drop for anemia testing.	

6. **Apply an adhesive bandage to the prick site.** 7. **Discard all materials used in the blood collection procedure in a labeled biohazardous waste bag.**	

4.F. Precautions to observe when collecting blood samples[4]

This section describes the universal (general) precautions to be followed during blood collection.[5] You should take precautions when collecting blood to prevent exposure to blood borne infections such as hepatitis B or HIV. Follow the steps below to ensure protection against blood borne infections.

- **If you must prick a second time**, do not prick the same finger or heel.
- **Do not use the same pair of gloves for more than one respondent**. If you have worked with one respondent and your gloves do not appear soiled, you must still discard them and put on a fresh pair of gloves when working with a different respondent. It is also possible that you use more than one pair of gloves when working with just one respondent if the gloves become heavily soiled.
- **Keep intermittent pressure** on the finger or heel during the blood collection process.
- **Do not milk the finger**: milking the finger may cause the interstitial fluid to mix with blood and dilute the blood sample giving false results. Also, if a large volume of tissue fluid mixes with the blood, the sample will be like a plasma sample instead of a whole blood sample.

[4] Adapted from National Committee for Clinical Laboratory Standards (NCCLS) 1997

[5] For the universal precautions regarding bloodborne pathogens, see the U.S. Centers for Disease Control and Prevention guidelines and the U.S. Occupational Safety and Health Administration (OSHA) standards for protection from exposure to bloodborne pathogen.

- **If your gloves are soiled with blood**, complete the blood collection process and change them immediately once you have finished with that respondent.
- **Wear latex gloves.** Gloves help to prevent skin and mucous-membrane exposure to blood. Gloves should be worn during blood collection, until the specimen(s) from a respondent is collected and all waste materials produced during the collection are disposed. At that point, the used gloves should be treated as biohazardous waste. A new pair of latex gloves should be used with each respondent. **Gloves must never be re-used!**
- **Avoid penetrating injuries.** Although gloves can prevent blood contamination of intact and non-intact skin surfaces, they cannot prevent penetrating injuries caused by the instruments used for finger or heel pricks. Safety lancet devices reduce the risk of penetrating injuries.
- **Do not use lancets for purposes other than a single finger or heel prick** to collect blood for the biomarker testing. The lancets should not be broken or destroyed for curiosity or other purposes. After the device is used, it should be placed in a puncture-resistant sharps container.
- **Wash contaminated areas.** If an accident occurs, any skin surfaces or mucous membranes that become contaminated with blood, should be immediately and thoroughly washed with running water or a large quantify of water from a bucket or basin.
- **Never eat or drink during the testing.** Eating or drinking while collecting blood samples may result in contaminating yourself and is prohibited during the blood collection and testing procedures.
- **Properly dispose of all biohazardous materials.** All materials coming in contact with blood must be placed in a biohazardous waste container after use and disposed of according to the survey's policy on infectious waste disposal. Take precautions when storing and transporting the waste during the fieldwork.

4.G. Good blood collection practices

- **Good position in relation to the respondent.** Position yourself well before you make a puncture on the respondent's finger or a child's heel, such as kneeling below the respondent's heart level.
- **Do not prick the finger or heel if it is cold!** Warm the hands by asking the adult to rub his/her hands together. **For children**, ask the parent/responsible adult to rub the child's hand or heel vigorously to warm the prick site.
- **Never "milk" the finger.** Excessive massaging or squeezing of the finger or foot will cause tissue juice to mix with and dilute the blood.

- **Never mix alcohol with the blood**. If the alcohol used to clean the puncture site mixes with the blood, it can cause hemolysis of the sample leading to errors in the testing results. To avoid this problem, the finger or heel must be air dried completely before being punctured.
- **Avoid obstructing blood flow**. It is important to hold the finger properly to allow the accumulation of blood at the puncture site. Holding the finger too tightly can obstruct blood flow to the finger.
- **Push lancet in firmly to avoid shallow punctures**. A deep puncture should be made for better blood flow and to have a representative concentration of red blood cells.
- **Dispose of biohazard materials as they are used**. Keep the biohazard bag and sharps container open during blood collection and drop each disposable item in the appropriate container as you finish using it.
- If blood flow stops before all biomarkers are collected/tested, lay out all new supplies to make a second prick.
- **NEVER** leave behind or give biohazardous waste to respondents or parents/responsible adults, even if they request it.

Chapter 5. HEMOGLOBIN MEASUREMENT (ANEMIA SCREENING)

Learning objectives

- Define anemia and its causes
- List supplies for measuring hemoglobin (Hb)
- List steps for anemia testing among children
- Demonstrate proper use and care of the HemoCue Hb analyzer
- List precautions in measuring Hb
- List steps in providing test results and anemia information for adults and children

5.A. Introduction

Red blood cells contain hemoglobin (Hb), an iron-rich protein that binds oxygen in the lungs and carries it to tissues and organs throughout the body. Anemia is defined as a reduction in the normal number of red blood cells or a decrease in the concentration of Hb in the blood. During the [COUNTRY] DHS, we will measure the amount of Hb in a respondent's blood. Respondents who have an Hb level below a defined cut-off will be classified as anemic.

Symptoms of anemia range include fatigue and weakness, shortness of breath and heart problems. During the [COUNTRY] DHS, we will measure the amount of Hb in the blood of men, women and children. Any respondent with an Hb level below 8.0 g/dL will be classified as severely anemic. Hemoglobin testing in the [COUNTRY] DHS will be performed using a HemoCue analyzer (Hb 201+). This widely used system measures Hb concentration from a drop of capillary blood obtained from a finger or heel prick. The test is rapid, allowing results to be reported to the adult respondent or parent/responsible adult of children and adolescents immediately following the testing procedure. Respondents found to have severe anemia will be referred to a health facility for treatment.

This chapter discusses the materials needed and the procedure for hemoglobin testing. In addition, guidelines regarding precautions to take during collection and testing, recording results in the Biomarker Questionnaire, and providing test results and anemia information to households are outlined.

5.B. Overview of anemia

Common causes of anemia include:

- Iron deficiency from inadequate intake of foods containing iron, such as red meat.
- Intake of foods that contain non-bioavailable iron such as iron compounds that have been used for fortification of food.
- Malaria and other parasitic infections (for example, schistosomiasis; hookworm).
- Blood disorders (for example, sickle cell anemia; thalassemia).

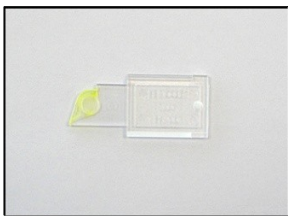
Anemia is a common and significant global health problem. Consequences of anemia include an increased risk of maternal and child mortality, impaired cognitive development in children, and increased numbers of pre-term and low birth weight babies.

The measurement of Hb is the primary method of screening for anemia. Hb measurement in the DHS provides an opportunity to:

- Estimate the prevalence of anemia in a nationally representative sample.
- Link the levels of anemia with demographic data so as to examine the socioeconomic, residential, and demographic differences in the prevalence of anemia among populations.
- Design programs to prevent iron-deficiency anemia among the populations most in need of intervention (for example, iron supplementation programs for young children living in rural districts).

5.C. Materials and supplies for Hb measurement

In addition to the Biomarker Questionnaire and supplies listed in Chapter 3, the following equipment and supplies are required for hemoglobin measurement:

Microcuvette: a plastic disposable unit that serves as both a reagent vessel and a measuring device. The tip of the microcuvette contains a dry, yellow reagent (sodium azide). The microcuvette is designed to draw up the exact amount of blood needed for the test.	

HemoCue Hb 201 + analyzer: a device that uses the absorption of light to measure the hemoglobin concentration of a single drop of blood collected in a microcuvette. Test results are presented on the analyzer's display.	
HemoCue Optronic Cleaning Swab: a cleaning swab used 1-2 times a week to clean the optronic unit in the HemoCue analyzer. Swabs are designed to absorb blood without smearing it.	

Two paper handouts are available to parents/responsible adults:

1. **Informational pamphlet:** a one-page document listing the causes of anemia, ways to prevent anemia and a record of household results for anemia and anthropometry measurements. See **Appendix A** for an example of an informational pamphlet.

2. **Anemia referral form for severely anemic respondents:** A completed form will contain the name and Hb result of the severely anemic respondent (defined as an Hb level below 8.0 g/dL) and should be given to the adult respondent or a child/adolescent's parent/responsible adult. The respondent should take the referral to a local clinic or health center to ensure he/she receives proper treatment for severe anemia. See **Appendix E** for an example of a severe anemia referral form.

5.D. Handling and storage of the HemoCue Hb 201+ analyzer

licrocuvettes:

lthough the HemoCue analyzer has proven to be durable and reliable under field conditions, there are some technical limitations related to the fact that microcuvettes are sensitive to humidity. Follow these instructions for the proper handling and storage of microcuvettes.

1. Always check the printed expiration date on the side of the container of microcuvettes before using or opening a new container. If the container is

expired, throw the microcuvettes away in the Sharps bin and open a new container.

2. Keep the microcuvette container at room temperature and avoid exposing the container to heat or strong sunlight.

3. Record on the microcuvette container the date it was first opened.

4. Remove only one microcuvette at a time from the container; use it immediately.

5. Remove the microcuvette by holding the side opposite the tip.

6. After taking a microcuvette out of the container, immediately snap the container lid back on tightly.

nder these conditions, the microcuvettes can be stored for up to 3 months (90 days) after opening. **HOWEVER**, <u>under field conditions</u>, it is advisable to store the microcuvettes in the opened container for **no more than one month** (30 days). Microcuvettes from unopened containers can be used up to the expiration date on the container.

he HemoCue Analyzer:

o ensure the HemoCue Hb 201+ system operates properly, allow the analyzer to come to the ambient temperature and protect it from direct sunlight. The device operates optimally between 18 and 30° C. The photometer has an internal electronic "SELFTEST"; every time the analyzer is turned on, it automatically verifies the performance of its optronic unit.

he analyzer's black microcuvette holder has three operating positions: 1) pushed in, for measuring; 2) pulled out until "clicked," for placing the microcuvette; 3) completely withdrawn for cleaning.

5.E. Determine eligibility and obtain informed consent for Hb measurement

<u>Children</u>: Follow the steps below for anemia testing of eligible children 6-59 months.

You must first verify the eligibility of the child for anemia testing. To do so, follow the steps in the questionnaire starting at Q. 117.

<u>Q. 117: CHECK 103: IS THE CHILD AGE 0-5 MONTHS OR IS THE CHILD OLDER?</u>
Children age 0-5 months (i.e., <6 months), are not eligible for blood collection and

are therefore not eligible for either anemia testing.

Q. 118: RECORD NAME OF PARENT/RESPONSIBLE ADULT FOR THE CHILD.
This person will be asked for their informed consent to anemia testing for that child. Do not enter any information into the boxes labeled LINE NUMBER.

Q. 119: ASK CONSENT FOR ANEMIA TESTS FROM PARENT/RESPONSIBLE ADULT.

Process of obtaining informed consent for children:

Group	Process
Children (age 0-4 years)	Obtain the consent of one of the child's parents, or, in the absence of a parent, the consent of a responsible adult who is at least 18 years of age. If the parent or responsible adult does not consent to the test, do not perform the test.

Q. 120: CIRCLE THE CODE.
After reading the consent statement, record the parent/responsible adult's response to the request to allow the child to participate in the testing. If the parent/responsible adult agrees, circle '1' (GRANTED). If the parent/responsible adult refuses to allow the child to participate in the testing, circle '2,' (REFUSED) and skip to Q. 122.

Q. 121: SIGN NAME AND ENTER [FIELDWORKER] NUMBER OF HEMOGLOBIN MEASURER.
At this point, set up your station and proceed with the anemia testing.

Adolescents: Follow the steps below for anemia testing of an eligible adolescent age 15-17 years.

Example taken from the women's section of the Biomarker Questionnaire; the procedures are the same for adolescent males.

Q. 212: CHECK 203:
Since the respondent is age 15-17, put an X in the box 'AGE 15-17 YEARS.'

Q. 213: CHECK 204:
Since the respondent has never been in a union, put an X in the box 'CODE 4 (NEVER IN UNION)' and skip to Q. 217.

Q. 217: RECORD LINE NUMBER AND NAME OF THE PARENT/OTHER ADULT RESPONSIBLE FOR ADOLESCENT.
This person will be asked for their informed consent to anemia testing for that adolescent.

Q. 218: ASK CONSENT FOR ANEMIA TEST FROM PARENT/RESPONSIBLE ADULT:
Read the informed consent statement to the parent/responsible adult.

Q. 219: CIRCLE THE CODE.
If the parent/other adult responsible agrees, circle '1' (GRANTED). If he/she refuses to allow adolescent to participate in the testing, circle '2,' (REFUSED). If the

parent/other adult responsible for the adolescent is not present/other, circle ‘3’ and skip to Q. 225.

Q. 220: SIGN NAME AND ENTER [FIELDWORKER] NUMBER OF HEMOGLOBIN MEASURER.
Sign your name and entering your fieldworker number in the space provided.

Q. 221: CHECK 219:
Check Q. 219, if consent was granted to have the adolescent tested, put an X in box ‘CONSENT GRANTED.’ If consent was not granted, put an X in box ‘CONSENT REFUSED’ and skip to Q. 225.

Q. 222: ASK ASSENT FOR ANEMIA TEST FROM ADOLESCENT RESPONDENT.
Read the informed consent statement to adolescent respondent.

Q. 223: CIRCLE THE CODE.
If the adolescent agrees, circle ‘1’ (GRANTED). If she refuses to participate in the testing, circle ‘2,’ (REFUSED). If the adolescent refuses anemia testing, the test cannot be performed. If the adolescent is not present/other, circle ‘3’ and skip to Q. 225.

Q. 224: SIGN NAME AND ENTER [FIELDWORKER] NUMBER OF HEMOGLOBIN MEASURER.
Sign your name and entering your fieldworker number.

Adults: Follow the steps below for anemia testing of an eligible adult age 18-[49] years.

Example taken from women section of the Biomarker Questionnaire; the procedures are the same for men.

Q. 212: CHECK 203:
Since the respondent is age 18-49, put an X in the box ‘AGE 18-49 YEARS.’

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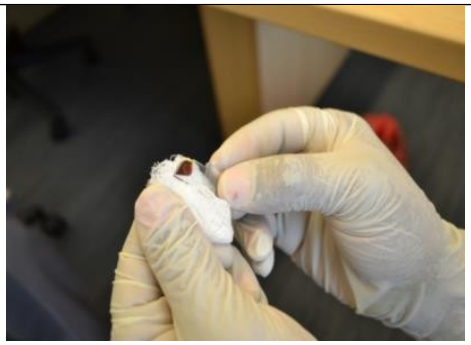
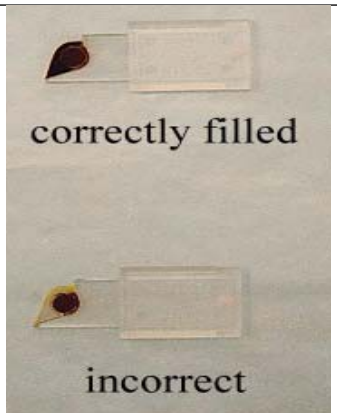
Q. 214: ASK CONSENT FOR ANEMIA TEST.
Read the following informed consent statement to the adult woman and allow for questions.

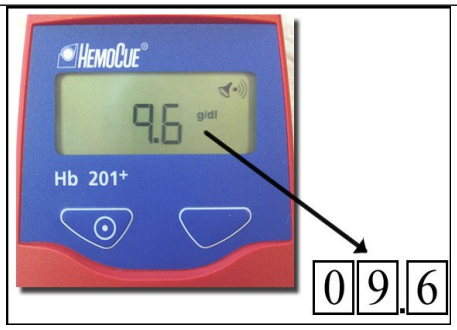
Q. 215: CIRCLE THE CODE.
If the adult respondent agrees, circle ‘1’ (GRANTED). If she refuses to participate in the testing, circle ‘2,’ (REFUSED). If the woman is not present/other, circle ‘3’ and skip to Q. 225.

Q. 216: SIGN NAME AND ENTER [FIELDWORKER] NUMBER OF HEMOGLOBIN MEASURER.
Sign your name and entering your fieldworker number in the space provided. Skip to Q. 225.

5.F. Steps in performing the Hb measurement

1.	**Prepare the supplies** following instructions in Chapter 3, prepare blood collection supplies. Take one microcuvette from the container and close the container tightly. Place the microcuvette on top of the analyzer.	
2. **3.**	Pull out the microcuvette holder to the "load" position **Press and hold the blue on/off button** until the display is activated. After 10 seconds, the display will show "READY" and - - -. This indicates the analyzer is ready for use.	
4.	If consent was granted, collect a blood sample from the respondent's finger or heel (for children 6-11 months) following the procedure described in Chapter 3. Use a sterile gauze pad to **wipe away the FIRST large blood drop from the finger or the heel. Use the SECOND large blood drop for [additional biomarkers].**	
5.	**Continue to apply light pressure to the finger until the THIRD drop of blood appears.** When the blood drop is large enough, fill the microcuvette in one continuous process. Check to make sure that the yellow area of the microcuvette is completely	

	filled. **DO NOT** "top-off" or refill the microcuvette. **DO NOT** let the microcuvette touch the skin.	
6.	**Wipe any surplus blood off both sides of the microcuvette** "like butter from a knife," using the clean end of a sterile gauze pad. Ensure that no blood is sucked out of the microcuvette when wiping it. **Do not** let the tip of the filled microcuvette touch the gauze.	
7.	**Visually inspect the microcuvette for air bubbles or improper filling.** Since air bubbles may influence the hemoglobin measurement, any microcuvette containing air bubbles must be discarded. In such cases, obtain permission from the adult or adolescent respondent or the parent/responsible adult of a child to repeat the test using a different finger or heel if the blood has clotted. You must use new disposable supplies and follow all the steps described previously in obtaining the new sample. Always use a new finger or different heel if repeating the test!	

8. Place the microcuvette in its holder and gently close the holder. **Note:** If the three dashed lines - - - disappear, simply press the on/off button and they will reappear. The analyzer is then ready to perform the Hb measurement.	
9. After the blood drop collection, **wipe any remaining blood from the prick site with a sterile gauze pad**. Press the gauze pad against the prick site until the blood flow has stopped completely. **10.** **Apply an adhesive bandage to the prick site.** For children, advise the parent or responsible adult, especially when the child is a toddler, to carefully watch that the child does not take off the bandage and put it in his/her mouth as the child may choke on it.	
11. **Read the Hb result.** The microcuvette should be analyzed immediately, and no later than **ten** minutes after being filled. The blood hemoglobin level in grams per deciliter (g/dl) is displayed 15 to 45 seconds after the drawer is closed.	

Note: HemoCue values rarely fall below 4 g/dL and cannot exceed 25.6 g/dL.	
12. **Remove one glove to record the hemoglobin level as shown on the HemoCue analyzer in the appropriate box in the Biomarker Questionnaire and on the anthropometry and anemia pamphlet**. If there is no value to record because the respondent was not present, the parent/responsible adult refused to consent to the test, or there was some other problem, record the appropriate code.	
13. **Using your gloved hand, take out the microcuvette and put it in the Sharps container.** Gather up all the other used testing materials and your gloves and put them in a labeled biohazardous waste bag. **Note**: Throughout the entire collection process, biohazardous waste should have been disposed of immediately into either a biohazardous waste bag or Sharps container. Never leave biohazardous waste on the absorbent pad to dispose of after the blood collection and hemoglobin reading are recorded!	
14. **Give the informational pamphlet to the adult or parent/responsible adult.** Inform him/her of the result and provide him/her with the informational pamphlet. When reporting the result, briefly explain what the Hb reading means, using the informational pamphlet as a guide.	

15. Provide a written referral to any respondent with severe anemia, defined as an Hb level below 8 g/dL. Inform the adult or the parent/responsible adult of children and adolescents about the effects of severe anemia. Record the Hb measurement on a Severe Anemia Referral form and encourage the respondent to seek follow-up medical attention.

5.G. Precautions to take during Hb measurement

Please take the following precautions while doing hemoglobin measurement:

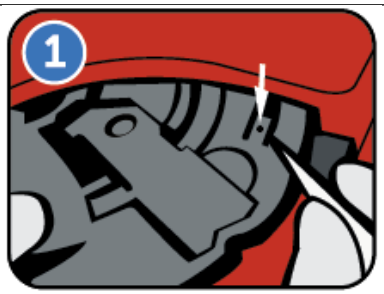
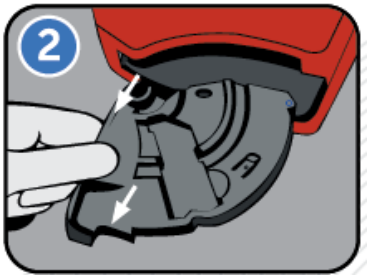
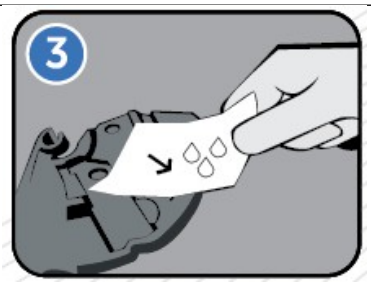
- If you must prick a respondent a second time, do not prick the same finger or heel.
- Keep intermittent pressure on the finger or heel during the blood collection process.
- Do not milk the finger: milking the finger may cause the interstitial fluid to mix with blood and dilute the blood sample giving false results. Also, if a large volume of tissue fluid mixes with the blood, the sample will be like a plasma sample instead of a whole blood sample.
- If your gloves are soiled with blood, complete the blood collection process and change them immediately once you have finished with that respondent.
- **Never remove a microcuvette from the container with fingers wet with alcohol**. This can result in alcohol coming into contact with the reagents inside the microcuvette and destroying them. Using fingers wet with alcohol to handle other microcuvettes in the container can also affect them.
- **Never use the first two drops of blood for hemoglobin testing**. [Wipe away the first blood drop, use the second for [biomarker]]. **Always use the third blood** drop for anemia testing. This ensures the free flow of blood and allows for the collection of blood with a representative concentration of red blood cells.
- **Avoid inadequate filling or re-filling of the microcuvette**. The chamber of the microcuvette that contains dry reagents (yellow portion) has to be completely filled. The microcuvette should be filled with a drop of blood in one continuous motion. A microcuvette that contains air bubbles should be discarded.
- **Avoid getting blood on the outside of the microcuvette**. Blood on the exterior of the microcuvette should be removed; failure to clean the exterior of the microcuvette can lead to an erroneously high hemoglobin reading.
- **Avoid keeping the microcuvette out for too long.** Keeping the microcuvette out of the container for too long before using it can lead to errors. Remove the microcuvettes from its container immediately before starting the testing procedure.
- **Avoid misalignment of the microcuvette in the HemoCue analyzer**. The microcuvette only fits into the photometer's microcuvette holder in one position. Therefore, place it carefully in the holder and slowly push the holder inside the photometer to obtain a reading. Slamming the microcuvette holder

can cause blood to spray onto the optronic system, an action that can damage the photometer.

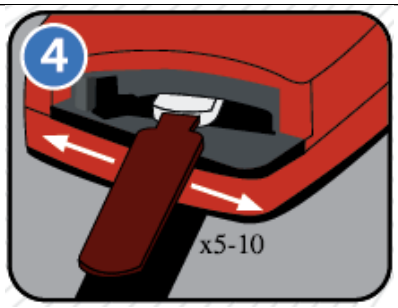
- **Do not use any microcuvette from a container that has been opened for more than 30 days or improperly stored microcuvettes for testing**. While in the field, microcuvettes should not be used if more than 1 month has elapsed since the seal on the container was broken. The containers must be kept closed when not in use to avoid exposure to moisture, which can destroy the reagents.

5.H. Cleaning the HemoCue Hb analyzer

After each day of field work, clean the microcuvette holder. An alcohol swab or cotton wool/cotton tipped swab moistened with 70% ethanol or isopropanol can be used to clean the microcuvette holder. Follow these procedures to clean the microcuvette holder:

1. Check that the analyzer is turned off and the display window is blank. 2. Pull the microcuvette holder out of its loading position. Carefully press the small catch positioned in the upper right corner of the microcuvette holder.	
3. While pressing the catch, carefully rotate the microcuvette holder towards the left as far as possible. Carefully pull the microcuvette holder away from the analyzer.	
4. Clean the microcuvette holder with an alcohol swab or cotton wool moistened with 70% alcohol (ethanol or isopropyl alcohol). It is important that the microcuvette holder is completely dry prior to reinserting it in the photometer.	

5. Once or twice per week, clean the optronic unit with the HemoCue cleaning swab provided by pushing the swab into the opening of the microcuvette holder. The microcuvette holder should still be removed. Move the cleaner from side to side 5-10 times. If the swab is stained (blood or dirt), repeat the cleaning procedure with a new swab. Do not clean the optronic unit with 70% alcohol. It is important that the microcuvette holder is completely dry prior to reinserting it in the analyzer.



6. Wait 15 minutes before reassembling the draw to the HemoCue analyzer.

Note: The optronic unit of the HemoCue analyzer should be cleaned 1-2 times a week with a HemoCue cleaning swab. Blood may get on the optronic system if you do not wipe the outside of the microcuvette before placing the microcuvette in the holder. If this happens, you will get an error message (E01-E05; E09-E30). Clean the HemoCue analyzer as described above when you get one of these error messages. A complete list of error codes is provided at the end of this chapter.

5.I. HemoCue analyzer error codes

Symptom	Explanation	Action
The analyzer shows an error code.	May be a temporary fault	Turn off the analyzer and turn it on again after 30 seconds. Take a new microcuvette and repeat the measurement. If the problem continues, see specific error code below.
E00	No stable endpoint is found within the time range. 1. The cuvette is faulty. 2. The circuit board is out of order.	1a. Check the expiration date for the microcuvettes. 1b. Take a new microcuvette and repeat the measurement. 2. The analyzer needs service. Contact HemoCue, Inc.
E01–E05	1. Dirty optronic unit or faulty electronic or optronic unit	1a. Turn off the analyzer and clean the optronic unit as descriped in the maintance section. 1b. The analyzer needs service. Contact HemoCue, Inc.
E06	1. Unstable blank value The analyzer might be cold.	1. Turn off the analyzer and allow it to reach room temperature. If the problem continues, the analyzer needs service. Contact HemoCue, Inc.
E07	1. The battery power is too low.	1a. The batteries need to be replaced. Turn off the analyzer and replace the batteries, 4 type AA. 1b. Use the power adapter.
E08	The absorbance is too high. 1. An item is blocking the light in the cuvette holder.	1a. Check that the analyzer and microcuvettes are being used according to the HemoCue Hb 201+ operating manual and instructions for use. 1b. The analyzer needs service. Contact HemoCue, Inc.
E09–E30	1. Dirty optronic unit or faulty electronic or optronic unit	1a. Turn off the analyzer and clean the optronic unit as described in the maintance section. 1b. The analyzer needs service. Contact HemoCue, Inc.

Symptom	Explanation	Action
HHH	1. Measured value exceeds 25.6 g/dL (256 g/L, 15.9 mmol/L)	
No characters on the display	1. The analyzer is not receiving power. 2. If on battery power, the batteries need to be replaced. 3. The display is out of order.	1a. Check that the power adapter is connected to the AC power supply. 1b. Check that the power adapter is securely connected to the analyzer. 1c. Check that the cable is not damaged. 2. Turn off the analyzer and replace the batteries, 4 type AA. 3. The analyzer needs service. Contact HemoCue, Inc.
The display gives erroneous characters.	1. The display is out of order. 2. The microprocessor is out of order.	1. The analyzer needs service. Contact HemoCue, Inc. 2. The analyzer needs service. Contact HemoCue, Inc.
The display shows "▭".	1. The batteries need to be replaced. 2. If on AC power, the power adapter or the circuit board is out of order.	1. Turn off the analyzer and replace the batteries, 4 type AA. 2a. Check that the power adapter is properly connected and working. 2b. The analyzer needs service. Contact HemoCue, Inc.
The display does not switch from "⧗"and "Hb" to three flashing dashes and "◉"(ready for measuring).	1. The magnet in the cuvette holder may be missing. 2. The magnetic sensor is out of order.	1. The analyzer needs service. Contact HemoCue, Inc. 2. The analyzer needs service. Contact HemoCue, Inc.

Symptom	Explanation	Action
Measurements on control materials are out of range – either too HIGH or too LOW.	1. The microcuvettes are beyond their expiration date, damaged or have been improperly stored. 2. The optical eye of the microcuvette is contaminated. 3. The control has not been mixed properly and/or is not at room temperature. 4. Air bubbles in the microcuvette 5. The optronic unit is dirty. 6. The control is not suitable for use with the HemoCue Hb 201+ system. 7. The calibration of the analyzer has been changed. 8. The controls are beyond their expiration dates or have been improperly stored.	1. Check the expiration date and the storage conditions of the microcuvettes. 2. Remeasure the sample with a new microcuvette. 3. Make sure that the control is mixed properly and at room temperature. 4. Check the microcuvette for air bubbles. Remeasure the sample with a new microcuvette. 5. Clean the optronic unit as described in the maintance section. 6. Only use controls intended for the HemoCue Hb 201+ system. Contact HemoCue, Inc. for control information. 7. The analyzer needs service. Contact HemoCue, Inc. 8. Check the expiration date and the storage conditions of the control. Take a new microcuvette and repeat the measurement from a new vial/bottle of control.
Measurements on patient samples are higher or lower than anticipated.	1. Improper sampling technique 2. The microcuvettes are beyond their expiration date, damaged or have been improperly stored. 3. The optical eye of the microcuvette is contaminated. 4. Air bubbles in the microcuvette 5. The optronic unit is dirty. 6. The calibration of the analyzer has changed.	1. See pages 8-17 in this manual. 2. Check the expiration date and the storage conditions of the microcuvettes. Check the entire system with a commercial control. 3. Remeasure the sample with a new microcuvette. 4. Check the microcuvette for air bubbles. Remeasure the sample with a new microcuvette. 5. Clean the optronic unit as described in the maintance section. 6. The analyzer needs service. Contact HemoCue, Inc.

Chapter 6. BIOHAZARDOUS WASTE DISPOSAL

Learning objectives

- Define biohazardous waste
- Define biohazardous waste disposal
- How to collect and store biohazardous waste during training and fieldwork
- Procedures for field disposal of biohazardous waste
- Methods of destroying biohazardous waste

6.A. Introduction

Any material that has come in contact with blood or other bodily fluids such as lancets, microcuvettes, alcohol swabs, gauze, and gloves are considered to be biohazardous waste (hazardous to other humans). Safe disposal of such material (biohazardous waste disposal) is crucial to prevent the transmission and spread of various bloodborne diseases, such as hepatitis B and HIV, among survey personnel and survey respondents. Biohazardous waste must be collected in biohazardous waste bags or sharps containers immediately following blood collection and testing, securely stored and transported, and safely disposed of prior to leaving a cluster. Both biohazardous waste bags and sharps containers have a special logo warning about biohazardous content. Sharps containers should be securely closed for safe storage and transportation of used sharp materials.

6.B. Collecting and storing waste during trainings and fieldwork

During training and while in the field/during data collection, all soiled (containing blood) biomarker supplies (for example: absorbent sheets, gloves, gauze, etc.), and their packaging will be placed in a biohazardous waste bag. Items identified as sharps, posing a personal health risk to biomarker technicians, respondents and anyone disposing of waste (for example: microcuvettes, safety-engineered lancets, etc.) will be collected in a sharps container.

Biohazardous Waste Bags

For the [YEAR] [COUNTRY] [SURVEY], three sizes of biohazardous waste bags are provided: **small** 2-3 gallon (7.5-11.3 liters), **medium** 7-10 gallon (26.5-37.8 liters) and **large** 12-14 gallon (45.4-52.9 liters). The **small** "household" waste bag will be used to collect all the non-sharps biohazardous waste from one household. Once the biomarker technician has completed processing all eligible respondents within a single household, the small biohazardous waste bag should be tied in a knot making sure to remove any excess air. When traveling from one household to another, all individually knotted small biohazardous waste bags should be stored in a **medium**

"field" waste bag for easier transport. Thus, the biomarker technician can carry around one medium biohazardous waste bag instead of five or so small waste bags. At the team space or vehicle (wherever the biohazardous waste is being stored), all used medium biohazardous waste bags should have the excess air removed from them and be transferred for storage into a **large** "cluster" waste bag. The large biohazardous bag should hold all the waste collected within a cluster. If not, a second cluster bag may be used. See the table below for each biohazardous waste bag and their appropriate use.

Biohazardous Waste Bag	Appropriate Use	Storage When Filled
2 to 3-gallon	Small household biohazardous waste bag	Store inside of medium biohazardous bag
7 to 10-gallon	Stores the small biohazardous waste bags used in households for easier transport though the field	Store inside of large biohazardous bags
12 to 14-gallon	Stores the medium biohazardous waste bags per cluster	Store at the team space until disposal at a local health facility

If all the waste from one household will not fit into one 2-3 gallon small biohazardous waste bag, please use another small bag to collect the remaining household waste. Generally, 1-2 large cluster bags are enough to hold all the waste from one cluster.

Sharps Containers

For the [YEAR] [COUNTRY] [SURVEY], [SIZE] sharps containers are provided. Sharps are any items used to measure biomarkers (and as a result are contaminated with biohazardous bodily fluids or blood) that can puncture through the thin plastic biohazardous waste bags. Examples include lancets, microcuvettes, rapid diagnostic test cartridges, capillary tubes, and glass slides. All sharps containers used in the XDHS are made of puncture-proof plastic so any item placed inside of them will not puncture through the material. This is not the case for the plastic biohazardous waste bags. Sharp items include, but are not limited to, safety-engineered lancets, lancet covers and microcuvettes. To protect both the biomarker technicians and the respondents, safety-engineered lancets are used to reduce exposure to blood and injuries. These lancets are one-time use and thus, the blade permanently retracts into the casing after being triggered. However, if these lancets are tampered with after use (i.e., taken apart), it is possible to recover the blade inside the casing, so we place lancets inside the sharps container. Unlike the biohazardous waste bag, items cannot be recovered from the sharps container once

they are sealed.

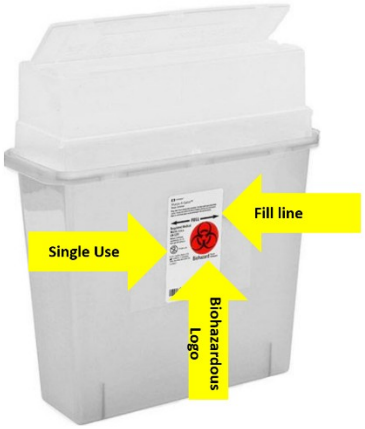
Note: you should NEVER attempt to remove any biohazardous waste material once it is discarded in the biohazardous waste bag or sharps container!

See the table below for sharps containers and their appropriate use.

Sharps Containers	Appropriate Use	Storage When Filled
5 quarts (4.7 liters)	Sharp biohazardous waste from a cluster	Store at the team space until disposal at a local health facility

All sharps containers recommended by The DHS Program have a fill line printed on the outside. Do not fill the sharps containers with material past this line. Sharps containers once sealed cannot be reused. So once a sharps container is filled, close the lid and dispose of at a health facility. Start each cluster with a new sharps container even if the last sharps container from the previous cluster has yet to reach the fill line.

Sharps container labels



6.C. Procedures for disposal of biohazardous waste

Biohazardous waste is generated at three stages during the YEAR] [COUNTRY] DHS: during the training, during field practice, and during fieldwork. Prior to generating any biohazardous waste, [Implementing Agency] in partnership with the [Ministry of Health, NACP or other country specific agencies] must identify health facilities that will dispose of the biohazardous waste collected according to [COUNTRY] national standards. A list of these health facilities and their contact information should be provided to the team supervisors by the [implementing agency] along with a letter from the MOH detailing the mission of the survey, introducing the team, and outlining the services needed from that facility.

At the end of training and after each blood collection within the household, all non-sharps materials used during the testing (i.e., gloves, alcohol swabs, and gauze pads) are to be placed in a 2-3 gallon household biohazardous waste bag. All sharp materials (i.e., lancets and microcuvettes) are to be placed in the sharps container. All biohazardous materials should be immediately placed in the appropriate waste bag or container after use. For instance, once you have pricked the finger or heel with the lancet, you should place the lancet directly into the sharps container, do not place the lancet back on the absorbent sheet.

Before proceeding to new cluster, team supervisors should identify (from the list of facilities provided by [IMPLEMENTING AGENCY], the local health facility where the waste can be safely destroyed. Team supervisors should contact the health facility prior to or soon after entering the cluster to introduce themselves and inform the local health facility that the team intends to dispose of the biohazardous waste from the cluster(s) there. One health facility may be used for the disposing of waste from multiple clusters; hence it is considerate to inform the local health facility ahead of time.

6.D. Methods of destroying/decontaminating biohazardous waste

It is likely that the local health facilities identified by the government for safe disposal of biohazardous waste during the [YEAR] [COUNTRY] DHS will use one or a combination of the following methods to destroy or decontaminate the biohazardous waste. The two methods listed below are the best management options for solid infectious waste for small-scale activities.

Incineration

Incineration is the process of burning biohazardous waste and reducing the waste volume by about 80%. Incineration can take place in a chamber or drum/brick furnace. Through this method, 99% of microorganisms on biohazardous waste and contaminated sharps are destroyed. However, the sharps found in ashes can still pose a physical hazard. Open-air incineration is less effective at disinfecting and has the potential for incomplete burning (leaving behind infectious material), is more hazardous to the staff involved and runs a greater risk of unburned supplies being scavenged by people and animals.

Autoclave

Autoclaving is the process of sterilizing waste with steam treating at high temperature and pressure. In order to be effective, the steam needs to be able to penetrate the waste. Autoclaving can also be used to sterilize reusable medical waste. We do not autoclave and reuse any of the materials used in the [YEAR] [COUNTRY] DHS.

A few points to remember when you are collecting and storing biohazardous waste in the field:

- **NEVER** leave biohazardous waste in households
- Biohazardous waste should **NEVER** be disposed of in general solid waste containers or facilities
- Never store anything in the biohazardous waste bags or sharps containers other than biohazardous waste
- Once closed, the sharps containers cannot be reopened, so take care when moving through the field not to close the container prior to reaching the fill line

Chapter 7. **APPENDIX**

7.A. Informational pamphlet

What IS malnutrition?

Malnutrition is a serious health condition that refers to undernutrition, micronutrient deficiencies, or overweight.

What CAUSES malnutrition?

- Not having enough to eat or not eating frequently enough.
- Not eating enough of the right foods.
- Poor health care and feeding practices.
- Frequent infections or disease.

Why is malnutrition DANGEROUS?

- It increases risk of death, infections, and chronic disease.
- Causes cognitive impairment leading to poor education performance.

What do the Height and Weight results MEAN?

- Height and weight on their own do not provide enough information on malnutrition status. Seek advice from a healthcare provider for more information.

How can malnutrition be PREVENTED?

- Exclusively breastfeed your child for the first 6 months of life and continue to breastfeed up to 2 years or beyond.
- Eat a variety of food, including fruits or vegetables for those 6 months or older.
- Avoid beverages or foods with lots of sugar or salt.
- Practice good hygiene and proper food handling.
- Prevent and treat infections and chronic diseases.

HEIGHT AND WEIGHT MEASURES				
Name	Name	Name	Name	Name
WEIGHT				
___ Kg	___ Kg	___ Kg	___ Kg	___ Kg
HEIGHT				
___ cm	___ cm	___ cm	___ cm	___ cm
HAEMOGLOBIN				
___ g/dl	___ g/dl	___ g/dl	___ g/dl	___ g/dl
Haemoglobin level diagnosis (circle one)				
Normal	Normal	Normal	Normal	Normal
Mild	Mild	Mild	Mild	Mild
Moderate	Moderate	Moderate	Moderate	Moderate
Severe	Severe	Severe	Severe	Severe

Hemoglobin values (Hb g/dl) in populations living at sea level:

	Children 6-59 months	Women		Men
		Pregnant	Non-pregnant	
Normal	≥ 11.0	≥ 11.0	≥12.0	≥13.0
Mild Anemia	10.0-10.9	10.0-10.9	11.0-11.9	11.0 – 12.9
Moderate Anemia	7.0-9.9	7.0-9.9	10.9 – 8.0	10.9 – 8.0
Severe Anemia	< 7.0	< 7.0	< 8.0	< 8.0

What IS Anaemia?

Anaemia is a serious health condition in which there are not enough red blood cells or haemoglobin in the blood.

Haemoglobin is a substance in the blood that carries oxygen to the body. Iron is important for making haemoglobin.

Why is Anaemia DANGEROUS?

- It reduces one's resistance to infections.
- Severe anaemia can lead to heart failure during childbirth, anaemic women are more likely to die from excessive bleeding.
- Anaemic children have low birth weight, poor learning capacity, and less resistance to infections than other children.

What do the Anaemia Test results MEAN?

Severe Anaemia: You have a seriously low level of haemoglobin in your blood. You need to see your doctor or health centre immediately for treatment. Eat more foods rich in iron and treat malaria and worms.

Moderate and Mild Anaemia: You should visit your doctor or health centre when possible to learn the cause of your anaemia. Eat more foods rich in iron and treat malaria and worms.

What CAUSES Anaemia?

- Loss of blood due to
  - parasites, especially hookworms;
  - excessive menstrual losses;
  - chronic diseases.
- Lack of iron in the diet or inability of the body to absorb iron from food.

How can Anaemia be PREVENTED?

- Pregnant mothers and children should take iron tablets or syrup.
- Eat a diet adequate in iron-rich foods such as dark green vegetables, liver, meat or fish, and fruits rich in vitamin C.
- Avoid giving tea to infants and young children.
- Avoid taking coffee or tea with meals.
- Prevent and treat worms.
- Prevent malaria by using mosquito nets.
- Limit the number of births through child spacing and delaying first pregnancies.

Iron Rich Foods:

dark green vegetables

meat, liver or fish

To increase the body's use of iron, eat more fruits and vegetables rich in vitamin C:

	oranges
	lemons
	Mangoes
	red bell peppers

Add MOH LOGO HERE	*ADD IA LOGO HERE*

COUNTRY Ministry of Health
COUNTRY IMPLEMENTING AGENCY

Contact Information: [ADDRESS]
[LAST NAME AND FIRST NAME]
Ph: (+XXX) XXX XXX

Name _____Date_____

MOH and [IA] are conducting the YEAR COUNTRY Demographic and Health Survey in which testing for anaemia is included. The study will help us identify whether there are problems with anaemia and other illnesses among women, and young children in COUNTRY.

We appreciate that you allowed us to interview you, test for anaemia, and measurement your height and weight. Thank you for your cooperation.

Please look inside for the results of your household's height and weight and for your anaemia testing.

7.B. Severe acute malnutrition referral

1.A. [YEAR COUNTRY] DEMOGRAPHIC AND HEALTH SURVEY:

1.B. Severe Acute Malnutrition Referral Form

1.C. During the [**YEAR COUNTRY] DHS** _____ (Name), age__ __ months / years, was assessed for acute malnutrition.

1.D. His/her weight was __ __ . __ __ kg and his/her height was __ __ __ . __ cm

1.E. His/her weight-for-height was - __ . __ Z-scores, which indicates he/she has severe acute malnutrition.

1.F. **THIS PERSON NEEDS MEDICAL ATTENTION FOR ACUTE MALNUTRITION IN A HEALTH FACILITY RIGHT AWAY.**

1.G. **Acute Malnutrition Referral Form** is given when *child's* weight-

7.C. Fieldwork maintenance log

FIELDWORK DAILY MAINTENANCE LOG - MEASURING BOARD

Equipment ID	Date (DD/MM/YYYY)	Cluster Number	Measurement in cm	Condition/Remarks	Not in use (check)	[Fieldworker] number
001						
001						
001						

FIELDWORK DAILY MAINTENANCE LOG - WEIGHING SCALE

Equipment ID	Date (DD/MM/YYYY)	Cluster Number	Measurement in kg	Condition/Remarks	Not in use (check)	[Fieldworker] number

7.D. Standardization form

[COUNTRY] DEMOGRAPHIC AND HEALTH SURVEY
Standardization of Measurers

First reading	1
Second reading	2

Name of Measurer: _____ **Date:** _____

No.	Name of Child	Age of the child (in months)	Height/length measurements	
			Measured lying or standing	Height/length measurements (cm)
Child 1		☐☐	Lying down.....1 Standing up.....2	☐☐☐.☐
Child 2		☐☐	Lying down.....1 Standing up.....2	☐☐☐.☐
Child 3		☐☐	Lying down.....1 Standing up.....2	☐☐☐.☐
Child 4		☐☐	Lying down.....1 Standing up.....2	☐☐☐.☐
Child 5		☐☐	Lying down.....1 Standing up.....2	☐☐☐.☐
Child 6		☐☐	Lying down.....1 Standing up.....2	☐☐☐.☐
Child 7		☐☐	Lying down.....1 Standing up.....2	☐☐☐.☐
Child 8		☐☐	Lying down.....1 Standing up.....2	☐☐☐.☐
Child 9		☐☐	Lying down.....1 Standing up.....2	☐☐☐.☐
Child 10		☐☐	Lying down.....1 Standing up.....2	☐☐☐.☐

7.E. Severe anemia referral

1.N. [YEAR COUNTRY] DEMOGRAPHIC AND HEALTH SURVEY: Anemia Referral Form

1.O. During the [**YEAR COUNTRY] DHS**_____(Name), age __ __ months / years, was tested for anemia on __ __/__ __/__ __. His/her level of hemoglobin was__ __ . __ g/dl, which indicates he/she has severe anemia. **THIS PERSON NEEDS MEDICAL ATTENTION FOR THE ANEMIA IN A HEALTH FACILITY RIGHT AWAY.**

1.P. **Anemia Referral Form** to be given when a respondent's hemoglobin level is **below 8.0 g/dL**.

1.Q.

1.R. Date Signature